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MYRICA NAGI *Thun.*

By David Hooper.
Quinologist to the Government of Madras.

Among the large number of astringent drugs indigenous to the East Indies, the bark of the Boxmyrtle (*Myrica Nagi*) has been long known. This tree belongs to a small natural order placed between the Urticaceæ and the Casuarinæ, and grows in India, the Malay Islands, China and Japan. The bark is collected in the sub-tropical Himalayas at altitudes of from 3,000 to 6,000 feet, and is occasionally exported in large quantities to the plains. It is used as a tan for fancy leather work, and in some districts it is employed for dyeing a peculiar pink; but as it is kept in stock by the native drug shops in Northern India this would indicate its chief use as a medicine.

In Sanskrit works the bark is described as heating, stimulant, and useful in diseases supposed to be caused by deranged phlegm, such as catarrhal fever, cough and affections of the throat. But like most Eastern remedies the bark is mostly prescribed in the form of a mixture with other stimulants, alteratives and aromatics. Dr. U. C. Dutt speaks of the powdered bark being simply used as a snuff for catarrh with headache. *Kaiphal*, the Hindustani name of the drug, mixed with ginger, according to some doctors, is the best medicine for cholera. Hindus and Mohammedan use *Kaiphal* at the present day as an astringent carminative and tonic, and prescribe it for chronic cough, fever and piles. Mixed with vinegar it strengthens the gums and cures toothache. It will be seen that it is used where astringents are required, either as an external or

internal remedy, but the large dose of 60 grains of the powdered bark is not the best method of administration.

About five years ago, Dr. Dymock sent me for analysis a sample of Myrica Kino. This substance occurred in a granular condition; it was of a dark purplish-red color, hard and brittle when dry, and without any peculiar odor. It dissolved almost completely in boiling water, but a flocculent red precipitate separated when the decoction cooled. A tincture made with rectified spirit was of a fine, bright red color and very acid in reaction. The tannic acid gave a greenish color with ferric chloride, and was estimated in a cold watery infusion of the drug with a solution of plumbic acetate. The "Kino" had the following composition:

Pure tannic acid,	60·8
Insoluble in water,	3·3
Moisture,	9·8
Ash,	10·8
Sugar, etc.,	15·3
	100·0

The large amount of carbonated ash left, on incineration, points to the probability of some of the tannic acid existing in combination with a mineral base, and this was really so. A large quantity of a substance readily reducing Fehling's test, is not a usual constituent of a natural astringent secretion like Kino, and I was relieved to find that the above substance had been prepared by evaporating a watery extract of the bark; this would account for the mineral matter and the glucose.

The bark of *Myrica Nagi*, when collected from large trees, is about half an inch thick, extremely scabrous, pitted from the separation of pieces of suber, of a mottled rusty brown and dirty-white color, suber warty; substance of bark and inner surface of a dull red color; it yields a red color to water; taste strongly astringent. Examined microscopically, within the suberous layer is seen a remarkable stratum of stony cells; the parenchyma throughout is loaded with red coloring matter, and permeated with large laticiferous vessels, from which a gummy latex exudes when the bark is soaked in water.

Mr. J. Ishikawa (*Chemical News*, December 3, 1880, p. 275) contributed a paper on materials containing tannin found in Japan, and from a substance named "Shibuki" bark (*Myrica rubra*) he obtained

from 11 to 14 per cent. of tannin. If we may conclude that this tree is the *M. rubra*, Sieb. et Zucc., then it is synonymous with *M. Nagi*, Thunberg, the very tree under discussion.

A sample of *Kaiphal* bark, from Bombay contained 11 per cent. of moisture and yielded 7·17 per cent. of ash. Estimated in the manner above mentioned, for tannin, it afforded 13·7 per cent. The lead compound of the organic acid contained 30 72 per cent. of oxide, a result which compares very closely with the amount found in the compound separated from the "Kino," namely, 31·88 and 30·36 per cent. in two estimations. The tannic acid, separated from the tincture by evaporation and treatment with water, gives a bluish-purple color with ferric chloride, but on adding this reagent to a decoction of the bark, a dirty green precipitate is formed.

Beyond determining the amount of tannic acid in an authentic specimen of this bark, and obtaining indications of an alkaloidal principle, I have not had opportunity for further examining the drug. It may on closer research be found to contain interesting crystalline principles, such as those recently separated from its neighboring plants, species of the *Ficus* and *Casuarina*.

MYRICA ASPLENIFOLIA L.

By Charles C. Manger, Ph.G.

Contribution from the Chemical Laboratory of the Philadelphia College of Pharmacy. No. 134.

An analysis of the rhizome of this plant was published by J. C. Peacock, in the American Journal of Pharmacy, 1892, p. 303.

The present analysis, which was carried out under the supervision of Prof. Henry Trimble, was made with the view of adding to the results of the above work and of contributing to the knowledge of the constituents of the leaves of this plant.

All the plant material used in this work was collected by the writer near Haddonfield, N. J.

After having been finely ground, 50 grams each of the leaves and rhizome were submitted to proximate analysis, Dragendorff's scheme being followed in the main.

The quantities of the different constituents in the aliquot parts of the extracts used are eliminated, and in their places are stated the percentages calculated on the above quantity.

The amounts of the petroleum ether, ether and absolute alcohol extracts were estimated by evaporating the whole extract to a constant weight on the water-bath.

In the case of the water, alkaline water and acidulated water, the total solids of the extract were determined by evaporating an aliquot part of the liter (to which volume all these watery extracts were adjusted) to constant weight at the above temperature.

The dried residue was ignited to estimate ash. The difference between total solids and ash was taken as organic solids, and upon the amount of these are based the percentages of these three extracts.

The ashes of the petroleum ether, ether and absolute alcohol extracts were too small to exact consideration.

In all cases glucose was tested for and estimated by making the liquid alkaline with sodium hydrate and then heating with Fehling's solution for twenty minutes on a water-bath. The cuprous oxide was then collected, washed, dried and converted by ignition into cupric oxide. Of the weight of the latter obtained, 45 per cent. was taken as the amount of glucose present in the fractional part of the extract under examination.

After boiling an equal volume of the glucose containing liquid, with one per cent. hydrochloric acid, and then making alkaline and following the above plan, any increased reduction of the copper solution was attributed to saccharose, the amount of which can be readily calculated from the relative molecular weights of the two sugars.

Previous to applying the above processes for the determination of these substances, tannin and coloring matter were removed by means of lead acetate. The filtrate from the lead precipitate was freed from lead by means of hydrogen sulphide, and, after filtering out the lead sulphide, the excess of this gas was dissipated by warming the liquid, which, when cooled and made alkaline, was in condition for treatment with Fehling's solution.

The tannin was determined by the method given under the special heading.

In the distilled water extracts, mucilage and albuminoids were estimated by mixing a portion of the liquid extract with four times its volume of alcohol; in the alkaline water extract this treatment was preceded with sufficient acetic acid to slightly acidify the liquid.

In all cases, after mixing with the alcohol, the liquid was allowed to stand for twenty-four hours, before collecting, washing, drying and weighing the precipitate. The washing was accomplished with a mixture of one volume of water and four volumes of alcohol.

The ultimate analyses were made by combustion in an open tube with copper oxide and a current of oxygen.

Moisture.—Weighed quantities of the leaves and rhizome were dried to constant weights at 110° C. The loss was considered as moisture. The leaves showed 8·40 per cent. and the rhizome 10·85 per cent.

Ash.—The dried residues from the moisture determinations were ignited in order to estimate the amount of inorganic constituents in the materials under examination. The ash of the rhizome equalled 2 27 per cent. and that of the leaves 2·76 per cent. of the original weight taken.

Analysis showed calcium and potassium sulphates and calcium and iron phosphates in the ash of the rhizome; while in that of the leaves it revealed the presence of potassium and calcium combined with sulphuric and hydrochloric acids, together with iron and calcium phosphates.

Silica was found in the ash of both.

The rhizome yielded ·74 per cent. of extract to the solvent action of petroleum ether, which was the first solvent employed.

The extract was of brown color and had a waxy lustre and fatty odor. It was soluble in absolute alcohol. When dissolved in petroleum ether and the solvent spontaneously evaporated, the waxy substance was deposited in a granular or crystalline form.

The corresponding extract of the leaves amounting to 2·52 per cent. was greenish black color, and of semi-solid consistence. Absolute alcohol dissolved about 50 per cent. of this extract, and left undissolved a black residue which was firm and waxy when cold. That portion of the extract which was soluble in absolute alcohol consisted mainly of resin and chlorophyll, the former of which was precipitated on the addition of water. The precipitate was soluble in solution of potassium hydrate, and was again obtained by acidifying the latter.

Stronger ether removed 2·04 per cent. of extract from the rhizome and 4·49 per cent. from the leaves. The first was a brown porous substance having a narcotic odor; the second a hard and brittle

extract of a dark green and shining appearance. Both extracts were largely resinous.

They were treated with hot water and the latter was filtered off while still warm.

Neither potassium cyanide nor ferric chloride gave indications of gallic acid in the cold water-soluble part of the extract of the rhizome. The former but not the latter reagent showed evidence of its presence at the same stage in the treatment of the leaves. Glucose was not contained in the water solution and glucosides were absent as was proven by boiling part of the solution with one per cent. sulphuric acid and making alkaline, Fehling's solution not being reduced.

That part of both extracts not soluble in water was treated with one per cent. sulphuric acid. This was filtered off, and the filtrates shaken successively with petroleum ether, ether and chloroform. No residues were obtained when the solvents were spontaneously operated, nor was anything removed from the filtrates after making them alkaline with ammonium hydrate and repeating the agitations with the above liquids in the same order. The resinous residues (and chlorophyll, in case of leaves), which were left after treating the extracts with water and one per cent. sulphuric acid, were soluble in absolute alcohol, from which they were partly precipitated upon the addition of water. This precipitated matter from the leaves was completely soluble in alkaline hydrates, producing solutions which were precipitated by dilute acids; while that from the rhizome was not altogether dissolved by the same solvents. Heat caused the undissolved part to settle in the form of a white flocculent precipitate, which is subsequently more fully noted.

Absolute alcohol, which was the next solvent applied, extracted from the rhizome 8·46 per cent. of porous, red-brown, substance and from the leaves 10·81 per cent. of black, brittle and bitter extract.

Both extracts were astringent, the first was soluble in water, with the exception of some dirty, reddish residue consisting mainly of resin, similar to that found in the ether extract. Water dissolved the greater portion of the extract of the leaves, but left undissolved a soft black mass composed of chlorophyll and resin which in this case, also, resembled that found in the ethereal extract. The water-soluble part of the extract of the rhizome contained 5·44 per cent. of tannin and ·53 per cent. of glucose; while that of the leaves

showed 8·74 per cent. of tannin, ·64 per cent. of glucose, and a smaller amount of saccharose.

The rhizome and leaves were next treated with water, which removed 6·96 per cent. of organic solids from the former, and 8·44 per cent. from the latter.

Each extract was made to measure one liter. Both were neutral in reaction. That of the leaves possessed a darker color than did the one from the rhizome. They contained the following principles to the amount given :

	From Rhizome.	From Leaves.
Mucilage and albuminoids,	1·52	·60
Tannin,	·83	1·33
Glucose,	·65	1·40
Saccharose,	small quantity.	small quantity.

After treatment with the preceding solvents, one liter of ·2 per cent. solution of sodium hydrate applied to each of the materials extracted 4·31 per cent. of organic solids from the rhizome, and 4·82 per cent. from the leaves. Both liquids were very dark, and both contained phlobaphene. Mucilage and albuminoids were present to the extent of 2·80 per cent. in the rhizome extract, and ·72 per cent. in the extract of the leaves.

After washing out all the alkali from the residues of the leaves and rhizome, they were subjected to the solvent action of a ·2 per cent. hydrochloric acid; the latter being used in successive portions until one liter of applied liquid was obtained in each case.

The liquids were yellow in both cases, that of the rhizome was found to contain 1·90 per cent., and that of the leaves 1·80 per cent. of the organic matter of the respective parts of the plant.

1·20 per cent. of pararabin and calcium oxalate were found in each extract by making a portion alkaline with ammonium hydrate, mixing it with four volumes of alcohol, allowing the liquid to stand for twenty-four hours, collecting, washing, drying and weighing the precipitated substances. A little over 50 per cent. of the leaves were found to have been dissolved by the above solvents.

That portion of the rhizome which remained after extraction with solvents was treated with chlorine in the presence of water. The loss in weight that was experienced showed that 8·15 per cent. of ligneous matter had been removed. When the residue from the above treatment was further acted upon with potassium chlorate

and nitric acid, a loss of 34·86 per cent, representing hydrocellulose (starch) and incrusting substances, occurred.

Deducting the weights of inorganic constituents still present, cellulose to the amount of 17·68 per cent. was left.

Volatile Oil.—To ascertain the presence of this, separate distillations were made of the fruit, leaves, stem and rhizome. In all cases the part was macerated with water over night, previous to distillation with it.

Thirty grams of the fruit collected in June gave a distillate of a very disagreeable odor. Petroleum ether agitated with this distillate removed a small amount of crystalline substance.

·5 kilogram of leaves similarly treated yielded a very aromatic distillate from which ether removed a small amount of volatile oil having a camphoraceous odor and a burning taste.

The oil obtained in this experiment resinified in a few days.

Another quantity of oil was obtained from the leaves in the same manner as was employed in the first case. This second sample was dried by means of calcium oxide and afterwards dissolved in absolute ether, the solution filtered and spontaneously evaporated. A clear yellowish oil was thus obtained and after standing for two weeks showed no tendency to become resinous.

The oil was specifically lighter than water. When distilled with water, the stem furnished traces of oil only, while from the rhizome still less was obtained.

Resins.—·5 kilogram of the leaves were percolated with acetone, the solvent recovered and the residue poured into water, which produced a turbid yellow mixture, and separated a soft, black, resinous precipitate, having a warm and acrid taste. The precipitate was dissolved in alcohol, and the solution so obtained poured into water which again threw out the resin and coloring matter. These substances were dissolved in alcohol, and when the latter was allowed to evaporate, were obtained in their original form. The residue was dissolved in chloroform and the solution agitated with weak solution of potassium hydrate. Upon separating the alkaline layer and slightly acidifying with dilute sulphuric acid, a brown resin was precipitated. This after drying was brittle.

Repeated and prolonged digestion of an alcoholic solution of this resin with animal charcoal did not serve to change the color, so the substance was re-obtained by evaporating the solvent.

The extract from a kilogram of the rhizome, prepared as in the case of the leaves, when poured into water gave a yellowish granular precipitate. This was dissolved in alcohol, and upon spontaneous evaporation of that liquid was obtained as a crystalline resin along with some amorphous resinous matter and a granular whitish substance. The last was found to be insoluble in cold alcohol after it had been separated from the resinous substances. A hot alcoholic solution of it was digested with animal charcoal and then filtered. Upon cooling, the principle was obtained in white flakes. The crystalline and amorphous resinous substances were treated with petroleum ether to remove waxy matter and then dissolved in alcohol.

The alcoholic solution was decolorized by animal charcoal, and, upon concentration, the filtrate separated stellate groups of colorless crystals. These melted between 200 and 205° C.

The absence of nitrogen in these crystals and in the white substance was proven by heating them with metallic sodium, treating the fused mass with water, adding ferric and ferrous salts and then supersaturating the alkali with hydrochloric acid, whereby no ferric ferrocyanide was produced. The average of the two combustions made of the crystals was:

Carbon,	76·16
Hydrogen,	10·43
Oxygen,	13·41
	100·00

When the white substance was heated in a paraffin bath to 25 ° C., it shrunk and became gray, but did not melt. When heated on platinum foil, it fused to a dark liquid and was completely consumed with the production of a luminous flame. It was identical with the substance noticed in the ethereal extract and was undoubtedly the granular substance noticed by Peacock (loc. cit.) during his investigation of the same extract The white flaky substance was submitted to ultimate analysis; the following is the average of three combustions:

Carbon,	73·50
Hydrogen,	11·53
Oxygen,	14·97
	100·00

The carbon showed signs of increasing with further purification, but lack of material prevented further work on the compound.

Tannin.—The amount of this constituent was determined by estimation of the separate parts gathered at different times of the year. The tannin was precipitated from decoctions representing 25 grams of the material in a liter. The decoctions of the rhizome were of a yellow color, those of the leaves and stem were reddish-brown.

A solution of 2 grams of gelatin and 10 grams of alum in the liter was used as a precipitant of the tannin. The precipitations were carried out in hot solutions. The precipitates were collected, washed with hot water, dried and weighed. Of the weight obtained, 54 per cent. was taken as the equivalent of gall tannin.

The estimations were made within twenty-four hours after the material was collected. The average of two or three closely agreeing results was used.

Month.	Tannin in moist state. Per Cent.	Moisture. Per Cent.	Tannin in absolutely dry state. Per Cent.	Ash. Per Cent
Leaves:				
June,	6·35	10·15	7·06	4·85
July,	9·42	8·40	10·28	2·76
Stem:				
July,	3·72	10·64	4·16	1·46
Rhizome:				
June,	3·46	10·87	3·88	2·27
August,	5·47	9·96	6·00	2·27
September,	4·86	9·85	5·33	2·25
January,	4·43	8·22	4·82	1·97

Preparation and Purification of the Tannin.—The filtrates from the precipitated resinous matters were used as the sources of this constituent. The following experiments were made on both leaves and rhizome. Attempts to remove the tannin by agitation with acetic ether were not attended with much success, as only a very small quantity of dark colored material was removed. A portion of the filtrate was precipitated with basic lead acetate, the precipitate collected, washed, suspended in water and decomposed by hydrogen sulphide. The lead sulphide was removed by filtration, and after the excess of hydrogen sulphide had been expelled by warming, part of the filtrate was shaken with acetic ether, but no more nor purer tannin was obtained than in the first attempt to separate it. The whole filtrate was then saturated with sodium chloride, and again agitated with acetic ether. Upon recovering the solvent under diminished pressure, a porous, reddish residue remained. This

was dissolved in commercial ether, and the filtered liquid evaporated under reduced pressure, whereby a porous tannin was obtained. The yield was larger from the leaves than from the rhizome.

No process of extracting and purifying these tannins could be called quantitative. A weak solution of the tannin gave the following reactions. For comparison there are also added the reactions of the tannin of galls and of canaigre.

Reagents.	TANNINS FROM Myrica.	Galls.	Canaigre.
Ferric chloride, and Ammon. hydrate,	dark blue ppt. / brownish-black ppt.	dark blue ppt. / brown ppt., purple liquid.	green ppt. / brown ppt.
Lead acetate,	whitish ppt.	white ppt.	yellowish ppt.
Gelatin,	pinkish ppt.	white ppt.	yellow ppt.
Tartar emetic, and Ammon. chloride,	no change. / flocculent ppt.	white ppt. / same unchanged.	no change. / flocculent ppt.
Potassium bichromate,	yellowish-brown ppt.	brown ppt.	greenish-brown ppt., darkening.
Calcium hydrate,	pinkish ppt., darkening.	ppt. darkening.	light pink ppt., turning red and brown.
Bromine water,	yellow.	no ppt.	yellow, then brown ppt.
Uranium acetate,	brownish-red color.	brownish-red color.	crimson color, upon standing a reddish-brown ppt.
Ferric acetate,	blue ppt.	blue ppt.	green ppt.

Starch having been detected in a cooled decoction of the rhizome, a separate estimation of it was made on the original material. For this purpose 2 grams of the fine powder were boiled for six hours with a 4 per cent. alcoholic solution of potassium hydrate. The residue was washed with alcohol till freed from alkali, and afterward with water to remove all coloring and soluble matter. The thoroughly washed starch granules and accompanying woody portions were boiled for three hours with one per cent. hydrochloric acid to convert the starch into glucose, which was estimated in the manner described above. The amount of starch which was calculated by proportion from the respective molecular weights of glucose and starch and the amount of glucose obtained, was found to be 8·24 per cent.

Starch was not found in the leaves.

NOTES ON THE GENUS MYRICA.

By George M. Beringer, A.M., Ph.G.

The order *Myricaceæ* or family of Galeworts, as now constituted, contains but a small group of plants, generally classified with the *Amentaceæ*. In its botanical relationship it is anomalous, being closely allied to several orders. Lindley characterized the "fragrant gales as just half way between the urtical and amental alliances." While its relations extend toward several orders, the aromatic character, the floral arrangement and fruit characters o these plants indicate its close approach to the *Juglandeæ*. From this order they are, however, distinguished by the superior free ovary and small slightly lobed seed, and different habit.

In accordance with the classification of Bentham and Hooker (Genera Plantarum), *Myricaceæ* as now constituted consists of but one genus, *Myrica*, whose characters become ordinal. The genera *Gale* of Tournefort and *Comptonia* of Banks being condensed into *Myrica*. The genus *Clarisia* of Ruiz and Pavon being referred to *Urticaceæ* and *Leitneria*, proposed originally by Chapman to describe our Florida species, *Leitneriæ Floridana*, Chapm. is raised to ordinal rank as *Leitnericæ*.

The genus contains about 35 known plants of an aromatic, shrubby character, distributed for the most part in the temperate regions. At least six species are indigenous to North America. But one species, *M. Gale*, L., is found in the bogs of Northern Europe. This is likewise generally distributed through the middle and northern United States, and extends as far north as Alaska. Several species are reported from the West Indies and one from the Andean region of South America. Others are found in Southern Africa, India and China. All medical writers and botanical authorities, even as early as Linnæus, describe the plants of this genus as useful in the arts and possessing valuable medicinal properties. As yet, they have obtained but little recognition in the practice of the medical profession.

Myrica Gale L. is the most widely distributed species. Some of its numerous synonyms are Sweet Gale, Meadow Fern, Bog Myrtle, Dutch Myrtle, Willow Myrtle, Bay Bush. The fruit of this species being resinous dotted, yields but a limited amount of waxy tallow. The leaves are known as *Folia Myrti Brabanticæ*,

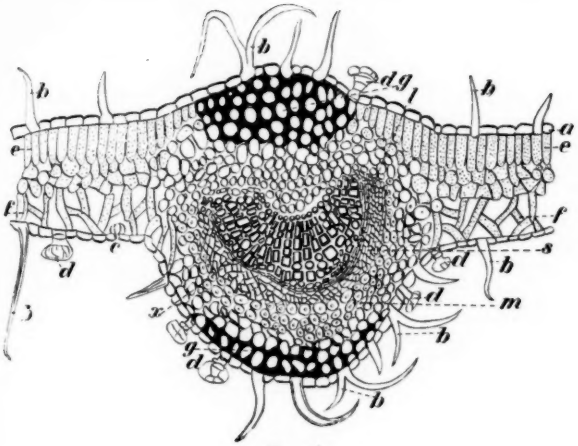

FIG. 1.

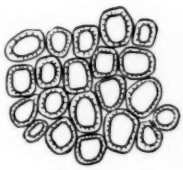

FIG. 4.

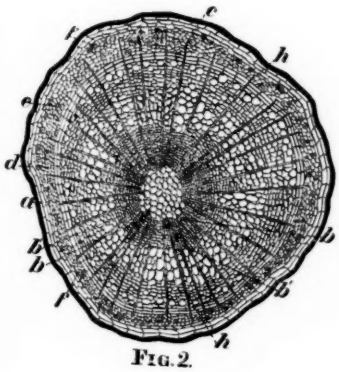

FIG. 2.

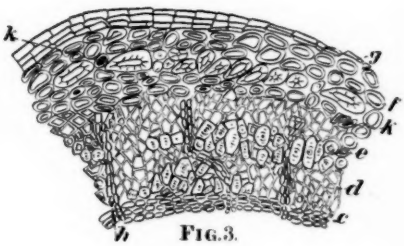

FIG. 3.

EXPLANATION OF PLATE.

FIG. 1.

Transverse section through a leaf of *Myrica asplenifolia* L. at the midrib, greatly enlarged. *a*, epidermis. *b*, trichomes. *c*, stomata. *d*, glands. *e*, palisade parenchyma. *f*, spongy parenchyma. *g*, collenchyma. *x*, xylem portion. *l*, cambium. *s*, sieve portion. *m*, bast.

FIG. 2.

Transverse section of stem of *Myrica asplenifolia* L. × 20. *a*, pith. *b*, xylem, spring growth. *b'*. xylem, fall growth. *c*, cambium. *d*, sieve portion. *e*, bast fibres. *f*, stone cells. *h*, medullary rays.

FIG. 3.

Section of cortex, showing sclerenchyma layer. × 50. *c*, cambium. *d*, sieve portion. *e*, bast fibre. *f*, stone cells. *g*, cork. *h*, medullary rays. *k*, secretion cells.

FIG. 4.

Pitted pith parenchyma. × 100.

and contain an essential oil. The entire plant is used and also the separated bark and leaves. To it is ascribed pectoral, astringent and aromatic properties. The infusion has been also applied externally for the cure of itch, and given internally as a vermifuge. The leaves have been used in Sweden as a substitute for hops in brewing. The entire plant is useful in dyeing and tanning.

The *Myrica cerifera* L. is the indigenous species that has attracted the most attention in the United States. Its common names are Wax Myrtle, Wax Berry, Candle Berry and Bay Berry. The fruit of this species is quite persistent, frequently adhering to the twigs for several years. The nuts are incrusted with a wax-like tallow, Myrica tallow. The wax was utilized by the pioneer settlers, and we have accounts dating back to the early part of the eighteenth century, of the methods generally adopted by each family to furnish themselves with a supply of this wax for lighting purposes. The South American species, *M. pubescens* W. (*M. caracasana* H.B.K.), contains similar fruit and has been utilized for the same purpose. According to an inaugural dissertation of George Schneider, Erlangen, 1890, the wax of *Myrica cerifera* is more closely allied to the fats than the waxes. He gives as its composition, palmitin 70 per cent., myristin 8 per cent., and lauric acid 4.7 per cent., mostly free. The bark of this species has attracted some attention, but principally among the eclectics, and is an ingredient in the so-called "Thompsonian Composition Powder." To the bark is ascribed stimulant, astringent, antiscorbutic, antispasmodic, sialagogue and errhine properties. It has been extensively used in domestic practice as a vegetable astringent in diarrhœa, and as early as 1804 Dr. Benjamin Smith Barton, then professor of Materia Medica and Botany in the University of Pennsylvania, called attention to it "as a powerful astringent used with success in diarrhœa," and states "the decoction has also been used with much advantage in dropsical affections succeeding intermittents and in the treatment of hæmorrhage from the uterus, etc." The decoction has also been used as a gargle in inflammation of the throat and as an injection in leucorrhœa. The powdered bark has been applied externally as a stimulant to indolent ulcers. In large doses it is stated to be acrid, drastic and emetic. The leaves are also stated to be aromatic, stimulant and astringent.

The most common species in this locality is *Myrica asplenifolia* (L) Banks. This species, the *Comptonia asplenifolia* of the earlier

manuals, is characterized by the globular fertile catkins, the ovary being surrounded by 8 long linear scales persistent in fruit. The leaves are narrowly lanceolate and pinnatifid, the lobes being numerous and rounded. In shape they resemble the fronds of the spleenwort fern and hence the specific name above given. They are pleasantly aromatic.

Our plant has enjoyed several names. Originally Linnæus placed it in the closely allied genus *Liquidambar*, naming it *Liquidambar peregina*. O. Kuntze now claims that the correct binomial should be *Myrica peregina*. *Liquidambar asplenifolia*, *Comptonia asplenifolia* and *Myrica Comptonia* are some of the names applied to it by various botanists. The common English names that have been given to it are Sweet Fern, Sweet Ferry, Sweet Bush, Fern Gale and Spleenwort Bush. Attention has recently been directed to the tannin present in a fair quantity in the rhizome and also in the overground portions of the plant. Lindley states that the aromatic bark contains Benzoic and Tannic acids with a resinous matter. The dried leaves yielded to Schimmel & Co., 0.08 per cent. of a peculiar volatile oil. The leaves and the rhizome and rootlets have been used quite extensively in domestic practice; tonic, astringent and alterative properties being assigned thereto. In the form of decoction, or this sweetened to make a syrup, it checks diarrhœa and is a favorite remedy in cholera infantum. It has been used for night sweats and the infusion externally applied in rhus poisoning. The dried leaves furnish the country lads with their first smoke. The syrup made from these leaves is a good disguise for quinine.

The writer is not aware of any published account of the anatomical structure of this plant. The leaf is quite hairy on the lower surface, especially at the midrib and margins. On the upper surface they are fewer in number, but more numerous along the midrib. The midrib is quite prominent on the lower surface of the leaf, and about 2 or 3 lateral veins extend into each lobe, and the anastomising, while not prominent, can be distinctly seen. Fig. 1 (see plate), illustrates the structure as shown on transverse section through the midrib. The surface is well marked with simple trichomes, many of which are branched, and with glands. The conductive system or fibro-vascular portion of the midrib consists of a broadly wedge-shaped almost semi-circular xylem portion, the wood cells and ducts being arranged ind istinct radial rows and subtended by a very narrow cambium

layer and a broader sieve portion. A crescent-shaped layer of bast cells extends beyond this, and in addition to this the mechanical system is strengthened by prominent layers of collenchyma cells situated below the epidermis and on either side of the midrib. The palisade and fundamental parenchyma cells are well filled with chlorophyll. The parenchyma toward the lower surface is of a spongy, open character.

The stem, on transverse section, exhibits a thin bark, the outer portion of which easily breaks away. The pith is irregular in shape and somewhat eccentrically located. The pith parenchyma cells possess somewhat thickened walls, marked with distinct pittings. The wood is in numerous narrow wedges, separated by narrow medullary rays extending well into the middle bark. The spring and fall deposits of wood are well marked layers, and the section shown in Fig. 2, made from the stem of a plant collected during the recent warm weather in March, shows that the deposition of the more open spring wood had already commenced. The cambium zone is narrow and is subtended by a rather broad phlœm layer containing numerous bast cells. The bast cells are pearly white in color and are greatly thickened, the stratification being distinct and the cavities almost obliterated. In the parenchyma of the middle bark there are numerous large stone cells, forming almost a complete zone of sclerenchyma. Associated with the parenchyma of the cortex are a number of secretion cells filled with a reddish latex, and the cells of the phelloderm are likewise impregnated with a similar substance. In the Pharmacographia Indica, Part VI, page 357, Hooper calls attention to a remarkable stratum of stone cells existing in the bark of the Himalayan species, *Myrica Nagi*, Thunb. A similar layer existing in *M. asplenifolia* L. would indicate that this was likely a structural characteristic of the order, and would warrant further investigation of other species.

Chlorine water decomposes so readily that if found at all in the stores it is of poor quality. Sealed glass tubes containing five grams of liquid chlorine are now to be had in commerce. With one of these it is possible to extemporaneously prepare one kilo. of chlorine water.

ANIMAL AND VEGETABLE FERMENTS.

By William B. Thompson.

A close examination of the functions of animals and plants or vegetables will reveal an analogy which becomes a highly interesting subject of study. The exact operations of the assimilative processes of plants, with their food-supply, are but meagrely understood or appreciated. In our own economies, we have reached some deductions which have proven great aids to physiological and medical science. The conversion of food into conditions in which it can be appropriated and become part of the living structure of animals and plants is accomplished by processes which, whilst they are exceedingly complex, yet are not, perhaps, beyond the possible limits of our knowledge. The fermentative processes favored by natural or artificial warmth and heat, and which are protected from destructive organic changes, seem to be one of the prime essentials in the wisely established scheme of the Creator for the supply of nutrition.

Whilst we may be able to effect some approximation to such change, by artificial methods, *outside* of these respective economies—animal and vegetable—yet we cannot penetrate into the living organisms and disclose exactly the intricate operations by which these are conducted. Therefore, we must, in a measure, grope and reach conclusion by logical deduction and observation.

Comparisons have been instituted between the peptic ferment of animal origin and its analogue as found in the juices of the *Carica Papaya* and the *Fructus Carica*. These comparisons have led to some interesting statements and observations, which deserve thought and attention, and should be taken up by the students of science, in which pharmacy can always find a legitimate sphere. In applying to both ferments their soluble action on albumen, we find, as usual, the pepsin active in the presence of egg-albumen in acidified media, whilst the evaporated vegetable juices, brought to a solid state, seem to act but feebly, if appreciably at all, upon the same substance—*i. e.*, egg-albumen—under like circumstances. Now, it is asserted that egg-albumen is an albuminate of calcium, and that we have no absolutely pure and isolated albumen. If the former be true—and it seems rational—a secret of the operation of pepsin in the weak acid (hydrochloric) solution may be better understood. If we consider for a moment, in this connection, that the chick derives its whole

calcareous structure, as well as the cartilaginous portion of its anatomy, from the substance enclosed within the shell, then calcium must certainly be there, pre-existent. Then, on the other hand, if vegetable juices or ferments are found to act best in alkaline media, it would indicate that, whilst there may be an analogy of function between the animal and vegetable ferments, yet they cannot indiscriminately be applied or used to restore diminished function in the *animal* economy. If the vegetable ferments, acting on the vegetable economy, change the albumen of plants to the more assimilable albumose in alkaline media only, this too would seem highly rational, because the normal juices of plants must be acid, else how could the soil-nutrition—the phosphatic elements—be taken up and appropriated?

In conclusion, it may be said, then, that these two ferments can only be compared in their analogy, their functions being adapted to different organisms. But these few cursory thoughts may furnish hints to the investigator and prove the initial of some interesting researches.

TEREBENE.

By H. W. Jayne, Ph.D.

The Pharmacopœia of 1890 requires that a pure terebene should have a specific gravity of 0·862 at 15° C., and boil between 156° and 160° C. In a paper read before this society in 1887 (American Journal Pharmacy, 1887, p. 65), I showed that a pure preparation contains no fraction below 160° C., and the same conclusion was reached by Power and Kleber (Phar. Rundschau, January, 1894).

Since 1887, I have examined a very large number of samples, and have found that all really pure and inactive terebenes gave no fractions under 165°, and very few, if any, under 170°. In these samples I have also found a wide variation in specific gravity. When we consider the difference in the gravity of commercial oil of turpentine, and note that the Pharmacopœia does not require the turpentine used in manufacturing terebene to have a certain gravity, it is to be expected that the resulting preparations should show widely different gravities.

Experience has shown that terebene is approximately 0·02 lighter than the turpentine from which it has been made.

Some grades of undoubtedly pure oil of turpentine show very low gravities.

Recently a shipment of oil of turpentine was received, having a gravity of only 0·855, yet was without doubt pure, tests failing to show any adulteration.

A large quantity of this oil was treated as usual, with small quantities of sulphuric acid in successive portions, samples being taken after each addition. The following table gives the results of each test, and clearly shows how the gravity falls and the boiling-point rises as the product becomes more inactive. The first column shows the gravity of the mixture of terebene, colophene, etc., before distilling with steam.

	Gravity bef re distilling.	Gravity after distilling.	Rotation for 10 c.m.	Percentage distilling to								
				160°	165°	170°	175°	180°	185°	190°	195°	200°
Original turpentine . . .	0·86	0·855	10° 45′	38	76	84	88	90	92	94	—	—
After first acid	0·88	0·852	9° 42′	18	64	80	85	88	90	93	—	—
After second acid . . .	0·90	0·843	5° 52′	—	10	46	70	80	86	92	—	—
After third acid	0·92	0·840	2° 7′	—	—	6	45	68	80	85	88	93
After fourth acid . . .	0·93	0·840	0° 16′	—	—	2	33	60	75	84	87	92
After fifth acid	0·94	0.835	0° 4′	—	—	8	46	68	78	82	86	89

The crude terebene so obtained was then distilled to remove the higher boiling portions.

Examinations of commercial terebenes show that many of them contain a large percentage of oil of turpentine, yet they appear to be satisfactory to the medical profession.

If a terebene containing a small amount of turpentine gives satisfactory results, it appears useless to prepare a perfectly inactive article, for the yield is then very small and the cost of production correspondingly high. A terebene containing only 3 per cent. of turpentine, on being treated to render it inactive, showed a loss of 50 per cent.

Recent investigation has shown that the solvent action of Rochelle Salt, as shown on the hydrates of iron and copper, also exerts itself on the hydrates of zinc, manganese, nickel, cobalt, chromium and aluminum. (Chem. News, **69**, 125.)

SOME THOUGHTS ON PHARMACY AS A PROFESSION.

VALEDICTORY TO THE CLASS OF 1894, PHILA. COLLEGE OF PHARMACY.

BY SAML. P. SADTLER, PH.D., Professor of Chemistry.

The ceremony, which we have but just now witnessed, may mean but little to the careless looker-on, but it is an important event, at least in the lives of the 183 young students who have participated in it, and may we not believe that it has some importance also for the profession into which these new members are about to enter.

It is estimated that there are at present some 40,000 druggists in the United States. Now, if we had an army of 40,000 trained and experienced veterans, and the question was as to the addition of some 600 new recruits (supposing that to be the number of graduates this year from the different colleges of pharmacy), we would not entertain the idea for a moment that such an addition could exert any notable influence. But if we consider the responsibilities attaching to the work of a pharmacist, its close relations to the practice of medicine, and the fact that the issues of life and death often depend upon the skill and accuracy of the compounder of medicines as well as upon the learning and judgment of the physician, and then reflect that of these 40,000 druggist, not over 8,000 at most have had the education of a school of pharmacy, the case presents a different aspect. We must then look upon the strengthening of this educated element among the druggists by some 600 new recruits, freshly drilled in the most recent advances of science and the results of the best methods of manipulation, carefully gathered for them by able and experienced instructors, as a very important matter. It is the sending out of new leaven which shall work through the whole body of practising pharmacists, strengthening what is good in it, and exerting influences that may in time be powerful and far-reaching.

The recurrence of this annual event, the commencement of full professional activity for the large body of young men now before us, we believe this has some importance for the profession into which they are about to enter. At the same time it gives us an opportunity to pause for a few minutes and look at the condition of the profession of pharmacy, to consider some of the drawbacks to its prosperity existing at present, and to consider suggestions for its improvement.

The profession of pharmacy is a peculiar one. It differs in important respects from the so-called learned professions of law and medicine, not in requiring less, for a competent pharmacist must be well grounded in quite a range of the sciences, but in the peculiar conditions under which it is practiced. It is considered unprofessional for the lawyer or the doctor to advertise, but the pharmacist is a vender as well as a professional man, and is expected to bring his wares to the notice of the public. And just here arises the first danger to him as one who has a profession, for the practice of which he has been educated. It is to lose sight of the fact that if he is a professional man he must be content to rise slowly as the young lawyer or doctor does, to enlarge his circle of patrons gradually, but gaining their respect at the same time and holding it. He is tempted to look at the purely mercantile side of his position and to stoop to clap-trap methods of drawing attention to himself and his store. This is said to show American "push" and "snap," but certainly there ought to be some other outcome than that from the years spent in acquiring a professional education. He may get the name of a "hustler," as it is termed, but does it not appear on closer inspection, that such a reputation is gained in most instances at the expense of professional standing? The methods of rush and push, of turmoil and struggle have, I fear, completely taken control of most of the mercantile communities in our American cities and large towns, but would it not be better for the educated pharmacist to aid in keeping such methods out of pharmacy and by avoiding catchy efforts to attract trade, dignify his profession and his own standing in the community?

Of course, it will be said, and with some truth, that in large cities especially, the competition is so great that the newcomer is obliged to push himself forward in order to get a foothold, that if he does not, he will be left behind, will starve, it is often said. But a man of good sense can soon see a difference between proper commendable enterprise and the unprofessional and sensational efforts to push oneself into notice, of which I have just spoken.

Again, the invasion of the apothecary's field by the patent medicine man, and the cultivation and solicitation of the physician directly by the manufacturing druggist are drawbacks which the pharmacist has to contend with. But is it not the mercantile rather than the professional side of his activity that suffers, and is it not true that,

in proportion as he has developed the professional side, he suffers less from these difficulties?

In other words, if he has become known as a skilful and able pharmaceutical chemist himself, who has kept up with recent progress in chemistry and pharmacy, he will suffer notably less from such drawbacks than if he had staked all his success on attracting attention to his store by advertising novelties.

Another of the drawbacks to the proper recognition of pharmacy as a profession is the comparison so often drawn between it and the related profession of medicine, and drawn, I need hardly say, in most cases to the disadvantage of the former. It is not alone drawn by the doctor, who from the time he leaves the Medical College calmly draws a line between himself and the "laity," as he calls the rest of the world. This superiority of the medical profession is too often conceded as a matter of course by the pharmacist, who feels the necessity of gaining the good-will of the medical profession living in his neighborhood as a question of business. Is it any wonder then that the public take him at his own estimate, and grow accustomed to give a respect to the one profession that they deny to the other? This difference in valuation is only encouraged when the pharmacist proceeds to demonstrate his belief in it by taking up medical studies, even after years of practical business life and adding the medical degree to that of Graduate in Pharmacy. I do not wish to be misunderstood here. Many young men enter upon the study of pharmacy, and pursue it diligently with the full intention from the beginning of following it by studies in medicine. For such a plan, I have nothing but commendation. I have repeatedly heard medical men, who had pursued this plan, acknowledge the invaluable aid that the thorough grounding in a knowledge of drugs and medicines and their preparation acquired in a College of Pharmacy gave them in the after practice of medicine. But cannot the graduate in pharmacy, who has had no such plan of study, who has only started out to acquire a pharmaceutical education, feel that he has a worthy profession before him, if he will but strive to make himself worthy of it? He has had an insight during his college years into the methods of work in chemistry, both analytical and synthetical, in operative pharmacy, the field of which is becoming wider every day, in microscopical study of plant tissue and drug structure. Is there then nothing that promises results for him in all this, results that will bring him both pecuniary reward and reputation?

I am not saying that, if he devote himself somewhat to these things, he will thereby come to the reputation of a Liebig in chemistry, or a Procter in pharmacy, or a Maisch in his knowledge of materia medica. But he will raise the standard of his profession and will be honored individually in having contributed to this result. Nor will the result be empty glory.

If the pharmacist is known to his neighbors and to the medical profession with whom he comes in contact, as a good chemical analyst, a thorough botanist and pharmacognocist, and, above all, a skilled compounder of all classes of official pharmaceutical preparations, he can rest assured that he will succeed, if he has, in addition, good common sense. Of course, all of these educational qualifications referred to may be thrown away on a visionary, rash and unpractical person.

I think we are ready now to consider some of the means by which the standard of the profession can be advanced and some of the drawbacks referred to removed.

In the first place, we want a better foundation to build professional study upon. With the development and strengthening of our common school system throughout the country, the liberal and scientific professions have been made accessible to a much wider range of individuals than was the case a generation ago. The son of the poor man is now able to start in life more nearly on terms of equality with the sons of the rich than was at one time the case. However, a common school education should be carried beyond the secondary school stage to enable a young man to appreciate the work put before him in coming to a college of pharmacy. Deficiencies in this preliminary education make it necessary for him to lose much valuable time in learning how to study and in developing his powers of observation and reasoning on experimental results.

This is not a condition of things without precedent in other professions. The medical profession was, and is to some extent yet, in a far worse condition. The young men beginning the study of medicine in many cases were not any better prepared to begin a professional study in a proper way, and, indeed, had less qualifications, as the year or two of shop practice which our students almost invariably have before coming to a college of pharmacy has been an introduction to the manipulation work of the laboratories. How did the better class of medical schools meet this deficiency?

In some degree, by preliminary examinations, but still more effectively by establishing graded courses and lengthening the course of study to three and four years.

The preliminary examination and the graded courses have been features of the work of our College for some years now, and the lengthening of the course to three years obligatory work will next follow. We must recognize the fact that the profession of pharmacy is setting a higher standard for its followers every year, as each successive revision of the U. S. Pharmacopœia shows, and more time will have to be devoted to the work of training for it. If, as said, a considerable part of the first year must perforce be devoted to teaching the student how to study, to observe, and to handle the necessary pharmaceutical and chemical apparatus, three years is not going to be at all in excess of the minimum requirement for systematic instruction. We have had three years of college work from a large number of our students in recent years, because of the division of either the Junior or the Senior course into the parts, which has been allowed under the name of the modified Junior and Senior courses. But the division was an arbitrary one, made to suit the student's convenience or fancy, and not always judicious. The whole subject of chemistry, for instance, in all its branches and applications had to be covered in two courses of lectures, and yet the student beginning without any knowledge of it, was supposed to be turned out well posted on the whole range of inorganic and organic chemistry and able to carry through the tests and assays required by the U. S. Pharmacopœia. With three courses of instruction, carefully graded and connecting together, it will be possible to cover more ground and cover it better than can now be done.

It is with much pleasure, therefore, that I can announce that the Philadelphia College of Pharmacy has determined to take this step towards improving the advantages she offers for thorough pharmaceutical education. With the beginning of the fall term of 1895, all students, candidates for her degree of graduate in pharmacy, will be obliged to enter for a three years' course, or coming from other colleges, and passing examinations for advanced standing, to take a corresponding portion of that time.

Not only will the lecture work be extended through three courses of systematically graded instruction, but during this time three thoroughly equipped laboratories will be open for instruction in the

practical and manipulative work of the three main lines of study represented in the college.

We hope thus to do our part in turning out young men able to enter upon the practice of pharmacy as a profession and not merely ready to open a store and cater to the public and its whims as the corner grocer does.

And now young men of the class of 1894, we have come to the last word. We have endeavored, as far as lay in our power, to assist you in getting your pharmaceutical education, and have brought you to the point when you are ready to launch out with your certificate of qualification to practice your profession. It is for you to say whether you will practice it in a manly, self-respecting way, or perpetuate and intensify the evils of which I have spoken by turning your back upon your opportunities, and forgetting your birthright as graduates of the Philadelphia College of Pharmacy.

That you may make such use of your powers as will make us proud of you and your record in the future, is the ardent wish and hope of your Alma Mater.

THE MANUFACTURE OF CALOMEL IN JAPAN.[1]

By Edward Divers, M.D., F.R.S.

Introductory.—Calomel, in the form common in England and all countries under Western civilization, is now extensively used and is even manufactured in Japan, under the name of *kankō*. But mercurous chloride is also largely used there under the name of "light powder," *keifun* (Chinese, *kingfun*), in another and very much older form, which is of signal purity, and made by a simple process as yet quite unknown in Europe. I witnessed this interesting process from beginning to end some years ago, and now make this publication of it to the Society, with full permission of the proprietor of the works I visited, Mr. H. Kokubu, who has aided me in every way he could, and notably with drawings, some of which illustrate this paper.

Historical.—According to Terajima Kokyō and Ono Ranzan, writers who lived in the last century, the first-named perhaps a little earlier, calomel was known in Japan as far back, at least, as the

[1] Journal of the Society of Chemical Industry, **13**, 108.

beginning of the eighth century, having then been presented to the Empress Genmiyo; but their authority is the *Zoku Nihongi*, reference to which Professor Haga, F.C.S., informs me makes it clear that mercury itself, not its chloride, was the thing presented.

In the time of the writers above named, mercurous chloride was well known and was manufactured in Japan, not only at Isawa, a village in Isé, where it is still made, but also in the city of Osaka and in a town near it, called Sakai. Mr. H. Kokubu, manufacturer, tells me that records exist at Isawamura of his family having carried on the manufacture of *keifun* there for the last three hundred years.

Far earlier, namely, in the tenth century, Minamoto-no-Shitagō, in his work entitled *Wamiyo-Ruijūsho*, makes mention of a mercurial preparation named *kōfun* or "powder of mercury." It is, however, questionable whether this was mercurous chloride or mercuric oxide, and therefore whether calomel was known or not at this time. But since calomel, under the name of *keifun*, is mentioned by Chinese writers even earlier than this, it may be safely accepted that Japanese knowledge of this body is older than ours in Europe. The Western knowledge of chloride of mercury dates from the first half of the sixteenth century, but the distinction between calomel and corrosive sublimate was not recognized till near the end of that century.

Literary.—The literature on Japanese calomel is meagre. Japanese writers of the old school have contented themselves for the most part with translating Chinese writings. Ono Ranzan mentions that the Japanese method differs from the Chinese, in making use of water in place of alum and other chemicals, in which he came near the truth. The late Dr. Geerts, a Dutch pharmacist, who in the Government service did much in establishing Western pharmacy in Japan, treated of *keifun* in some metallurgical contributions he made to the *Transactions of the Asiatic Society of Japan*. What he wrote is contained in Vol. IV (1875), and consists of information almost exclusively about Chinese calomel, and derived more from Chinese and Japanese writings than from any experience of his own. Concerning Chinese calomel English readers have the *Notes on Chinese Materia Medica*, among the "Science Papers" by the late Daniel Hanbury, F.R.S., edited by J. Ince. Hanbury mentions, as the result of his own observation, the characters of *kingfun* and its great purity but for the presence of minute, transparent, acicular

crystals of calcium sulphate. He refers to Porter Smith's *Contributions towards the Materia Medica and Natural History of China* for an account of the manufacture. Smith, however, takes his information solely from Pearson's account on p. 59, Vol. III. of Sir J. Davis's work *On the Chinese*. I have not seen this book but it is clear from Porter Smith that Pearson again has only derived his information from the Chinese Materia Medica, *Pun-tsaou-kang-muh*, and not from his own observation, and it amounts to this:—Common salt and mercury, of each 1 oz.; alum, 2 ozs., or salt, mercury, copperas, and saltpetre, in some such proportions are rubbed together and put into an iron bowl, which is then covered with a roomy earthen dish well luted down. This is exposed to the heat of a strong charcoal fire for four or five hours, when water is thrown on the cover and the cover taken off. On its inner surface the calomel is found adhering in the form of a beautiful, feathery, white sublimate. Ten parts of mercury are said to yield about eight parts of calomel. Dr. Geerts's paper, already referred to, contains essentially the same account, translated from the Japanese version of the Chinese work.

Lastly, there is a paper, in the Japanese language, on the manufacture of *keifun* at Isé, which is the forerunner of the present one. That paper appeared in 1887, in the *Journal of the Tōkyō Chemical Society*, written by Mr. T. Shimidzu, M.E., F.C.S., my former pupil and colleague, and it was his description to me of what he had seen that led to my own visit to Isé in company with Professor Haga in the following year. In one or two points I have availed myself of this paper to make my own account more complete.

Of the Specific Properties of Keifun.—Keifun is in very thin, minute scales, lustrous, transparent and white or faintly cream-colored. It might be described as micaceous calomel. To the touch it is soft and smooth. Measured in bulk, dry, it is four times as voluminous, more or less, as the ground calomel prepared by the European process, and can be readily scattered by a puff of the breath. Rubbed hard in a porcelain mortar, it gives the brown resinous streak characteristic of calomel, and the evidence, therefore, according to pharmaceutical authorities, of its freedom from corrosive sublimate. Exposed to bright sunlight, it gradually assumes a light brown color; a color, that is, having no affinity to gray or black. Moisture does not seem to favor this change, which is certainly not

owing to any reduction to metal. European calomel suffers a similar change. *Keifun* is free from corrosive sublimate and from metallic mercury.

Hanbury found selenite in Chinese calomel, and Geerts found calomel of this form generally adulterated with selenite and mica; but whether what he examined was ever Japanese and not always imported Chinese calomel he does not show. I have found *keifun* as it came direct from Isé quite free from adulteration, and have not met with any adulterated.

Of the Materials Used in Making Calomel in Isé, Japan.—The materials for making Japanese calomel are: mercury, an arenaceous, red clayey earth, bay-salt, bittern or salt mothers, and air. The mercury is imported from Europe, but in old times it is said to have heen found in the neighborhood of Isé, as cinnabar.

The earth, called *mitsuchi* ("seed-earth"), is all taken from a neighboring hill, Shunakayama, and, according to Mr. Kokubu, many other clays have been tried in place of it, always with bad results. It is of a rather light-brown red color, which changes to a duller and somewhat brown red on drying and gently heating the earth, and to a light ordinary brick red by a strong heat. As mined, the earth is seen to consist largely of colorless quartz grains. Besides the quartz a very little biotite is seen sparkling through it. The fresh, damp earth does not form a compact mass, but a slightly cohering aggregate of damp crumbs. This texture appears to be due to the earth being a mass of quartz in small grains, from the size of a hempseed down to that of impalpable particles held together by plastic clay. For use, that which does not contain coarse quartz grains too abundantly is selected, and is made into briquettes and moderately baked on the hearth of the fire-place under the calomel pots. These briquettes are then as light and porous as the prepared porous clay used in Fletcher's gas-furnaces. The raw earth, air-dried, is readily rubbed into its constituents by the fingers; and the baked briquettes very easily and rapidly reduced to a soft powder, quartz grains and all, in the agate mortar. The larger grains of quartz in the raw earth are also very brittle. I have treated thus fully of the mechanical characters of the earth, because probably much of its efficiency is due to them; but its chemical character also calls for notice. As baked ready for use, it contains in the thoroughly air-dry condition still 5 per cent. and more of water. Before ignition

it is almost entirely decomposed by sulphuric acid, either in some days in the cold or quickly by heat. It is also largely acted upon by hot hydrochloric acid; and, heated in sealed tubes with this acid to 120°–150°, it is almost as fully decomposed as by sulphuric acid. It contains practically no silica soluble in hot sodium carbonate solution, but after acid treatment yields, of course, much silica to this reagent. The composition of the earth, as found in use at the works, but rendered anhydrous, is as follows:

Quartz,	38·4
Combined silica,	24·2
Alumina,	26·3
Ferric oxide,	10·5
Magnesia,	0·3
	99·7

The magnesia is only got by fusion of the finely-ground earth with alkali carbonate, aud belongs to the particles of mica scattered through it. Only doubtful traces of phosphoric acid could be found, and, what is specially to be noted, no lime whatever. The earth is thus nothing but quartz, kaolin, ferric hydroxide, and a very little biotite, and is probably valuable to the calomel maker, not only for its highly porous texture, but also for its negative chemical qualities.

The bittern and even the rough bay-salt contain magnesium chloride, and this rather than sodium chloride must be the source of hydrochloric acid in the process. That air finds a graduated entrance to the other materials by diffusion during the process, will become evident from a consideration of the set-up of the apparatus,

Of the Plant.—The apparatus for making Japanese calomel consists of a table-furnace supporting 60 cast-iron pots lined and surmounted with the Shunakayama earth or *mitsuchi*, on which rest, as covers and condensers and receivers of the calomel, unglazed clay cups, bottom upwards.

In *Fig. 1* the furnace as it is when in action is seen from the working side; 10 pots on the left side are shown still to be charged and covered. The wooden step in front is to enable the workmen to reach over the table easily when charging the pots or emptying them. In *Fig. 2* the furnace is seen from the back or firing side, and with the walls broken away to show its interior and the method

of firing. In *Fig. 3* the mounting of the pots is shown in three stages by sectional plans of the table.

On a smoothed clay hearth the walls of the furnace are raised in clay, building in the three stones which frame the stoke-hole (*Fig. 3*). The walls are 2·6 feet high and the enclosure is 7·6 feet by 4·7 feet, measured outside. The stoke-hole is 1 foot by 1 foot, but a little wider than this at the base, and is without door. The table of pots and roof of the furnace is constructed (*Figs. 1 and 3*) by laying a square iron rod on each of the long walls, and on these 11 cross rods, also square, on which are to rest the flanges of the pots. The pots are then put in position as close together as possible, hanging

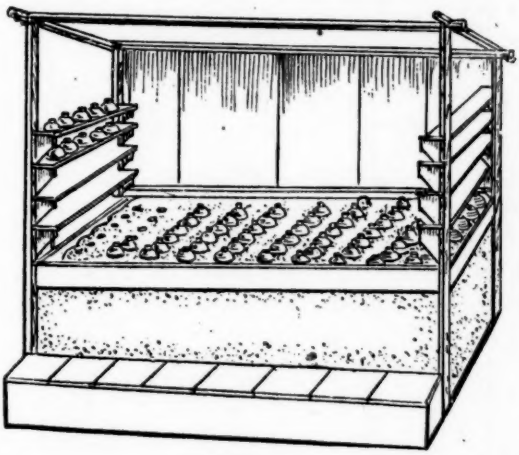

FIG. 1.

by their flanges, in 10 rows of six each, and plastic clay pressed into the openings left between the flanges and the roots, and the roots and flanges covered in so that only the mouths of the pots remain visible, as shown by the middle rows in *Fig. 3*. The furnace clay being thoroughly dry, it is deeply laid over with the red earth mixed with a little bay-salt and moistened with bittern in small quantity. The pots are also filled with the same moist red earth, except in a central cylindrical shaft (see the left side of the furnace-table in *Fig. 1* or the right side in *Fig. 3*), reaching to the bottom of the pot which is left bare. The pot is 0·5 feet deep inside, and across its mouth, inside, is 0·45 feet. It is shown in *Fig. 4*. The shaft or cavity left in the filling is 0·18 feet in diameter, and is shaped by resting a wooden core on the bottom of the empty pot, and then

pressing in the moist earth round it, smoothing off the top, and dropping a perforated board over the projecting core to hold down the earth while withdrawing the core, which is then removed by its handle. The furnace is now ready for work. It should have been

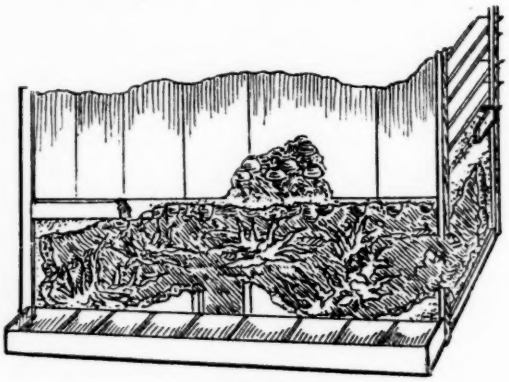

FIG. 2.

mentioned that after the clay walls of the furnace are built they are framed in with wood to increase their stability and to give support to a wooden back and to shelving above the table, as seen in *Fig. 1.*

Of the Firing.—The firing the pots is kept far below what are

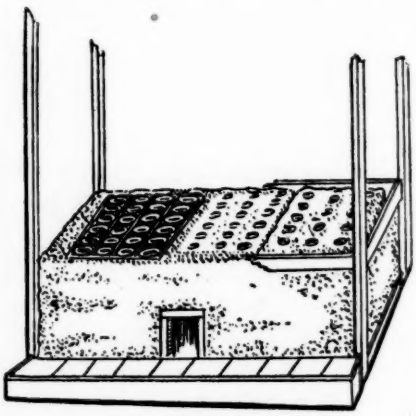

FIG. 3.

usually regarded as furnace heats. The fuel employed is wood, and the Japanese are clever in the use of this economically and effectively in firing pots for boiling, evaporating, distilling or subliming. The method of heating is seen in *Fig. 2.* Five lengths of firewood are

ranged along the back and front walls on the hearth, generally raised at one end by resting on a lump of clay. In the ordinary working of the furnace, as I saw it, the heat from previous work is sufficient to kindle the fresh wood. The flames rise up the sides and run over the bottoms of the pots, leaving the central space in the chamber free from flame. The air enters by the lower part of the stoke-hole and the products of combustion escape invisible by its upper part, so perfect is the combustion. At the time of first light-

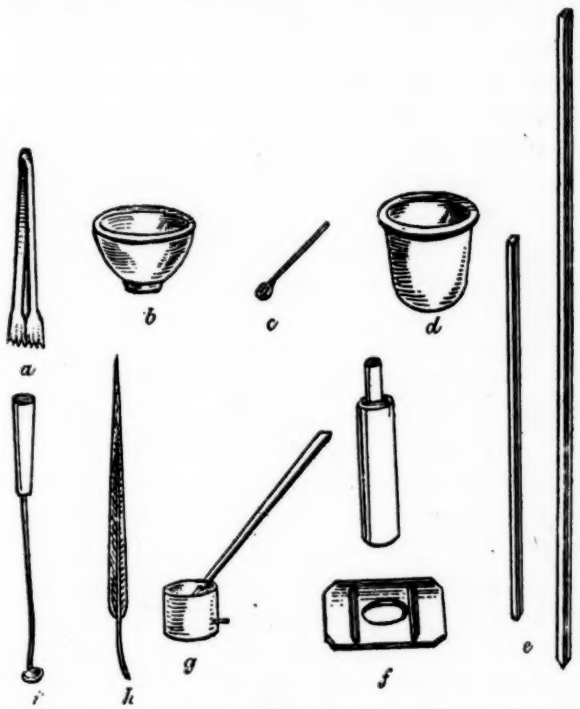

FIG. 4.

a. Tongs for lifting and dropping the lumps of wet compost into the pots.
b. Clay cup condenser.
c. Brass mercury spoon.
d. Iron heating pot.
e. Rectangular iron bars for pots.
f. Wooden core and board for lining pots.
g. Bamboo water pot for wetting furnace top.
h. Quill feather for emptying cups.
i. Peel for lifting compost ball out of pot.

ing the fire, and of irregularities in stoking, some smoke is unavoidable, and to keep the top and table free from this smoke and from

ashes, a wooden back is put in above the table, as shown in the Figures. There is also a wooden hood and flue above the stoke-hole to carry off any smoke; this is not shown in the Figures, but is similar to those put up in England and elsewhere over the working doors of furnaces to protect the workman from arsenic, sulphur, or other noxious fumes. The heating is so well effected that the pots, two feet above the burning logs, are made sufficiently hot, barely red-hot at the bottom, and yet the wooden frame on the outside of the furnace is not charred, and the workroom is not unpleasantly warm.

About three bundles, or 40 pounds, of wood serve for one firing, and it is remarkable to see so little fuel working so many pots.

Of the Working.—A compost of burnt *mitsuchi* with about a fourth of its weight of bay-salt is made up with bittern into lumps the size of large chestnuts.

The furnace being hot enough, the *mitsuchi* surface of the table is once for all freely wetted by a watering-pot, perhaps half a gallon of water being used, all of which is absorbed; a lump or two of compost is dropped, by tongs or by hand, into each pot in rapid succession, a very small spoonful of mercury poured into each pot, the total charge for the 60 pots being somewhat less than one pound avoirdupois (more exactly five-sixths of a pound), and a clay cup, bottom up, placed over each pot and adjusted by gently pressing and turning it round slightly. The cup is thus made to fit neatly on the earthen top without adhering to it in the least. The cups are thick and unglazed, but become very smooth inside by use. They have an inside diameter at the mouth of six inches and a depth of three inches.

Thus arranged, the pots and cups are left for three hours, and during the latter part of this time the furnace is cooling. When cool enough each cup is lifted in turn, and with two turns of a feather, the *keifun* or calomel, which fills it in the form of a sparkling network of delicate crystalline scales, is transferred to a sheet of paper held under it, and the cup, mouth downwards, placed on a shelf of the furnace ready for use in the next operation.

The calomel, it will thus be seen, forms no adherent cake in the cup, but particles only loosely hanging together. So obtained, it is ready for the market, needing only to be packed in small wooden boxes for sale.

The spent lumps of earth and salt are lifted out of the pots by the tool shown in *Fig. 4*, and when the furnace has become still cooler, the fire is made up again, the furnace top freely wetted, and a new operation set going as before. The furnace is worked twice each day. Nothing could well be carried out with greater simplicity and less expenditure of labor and time.

Of the Yield.—The loss, I am told, is about 16 per cent. of the theoretical amount of calomel, which is, I believe, about twice as much as is lost in the Western process.

Experimental.—If one of the cups is removed a few minutes after the operation has been started, much of the mercury is found in it as a sublimate of fine globules, mixed with only a little almost amorphous calomel, from which it would appear that the formation of the calomel results from reaction in the cup between the mercury in vapor and the active gases.

On dipping into the pot, uncovered during the process, a glass rod with a drop of water hanging to it and then withdrawing it, and testing the remainder of the water with potassium iodide and starch, no chlorine can thus be detected. The same is true when a drop of solution of potassium hydroxide is used. Nor can the slightest odor of chlorine be detected in the vapors issuing from the uncovered pot.

On passing air, containing a little hydrochloric acid gas, through a tube in which mercury is freely boiling, sparkling calomel is formed close to and mixed up with the mercury.

Red earth which has been used in the process turns moist, red litmus paper blue, while fresh red earth is neutral.

Theoretical.—The nature of the materials used and the observations gained by the preceding experiments are sufficient to establish that the calomel is formed by a reaction between mercury vapor, oxygen and hydrochloric acid gas, in which, along with mercurous chloride, water is formed—$4Hg + 4HCl + O_2 = 4HgCl + 2H_2O$, and that the formation takes place at a temperature near—above or below—the boiling-point of mercury, and much below that at which calomel freely volatilizes. The source of the hydrochloric acid is certainly the magnesium chloride of the bittern and bay-salt which, heated in a moist atmosphere, even in the presence of sodium chloride, is, as is well known, partly converted into magnesia and hydrochloric acid. Hence the alkalinity of used *mitsuchi*.

The porosity of the walls of the apparatus, particularly of the layer of *mitsuchi* on which the clay cup rests, must be more than sufficient to allow enough air to enter during the working. I had supposed that the hot hydrochloric acid and air might, in contact with the earth, have yielded a little chlorine, but the temperature reached in the process normally worked seems never to reach that required for the liberation of chlorine.

The Chinese process, *if correctly described*, differs from that used in Japan in several material points, one of which is that the mercury is intimately ground up with the other materials, and one fails to see what reaction can take place between it and the two others, namely, salt and alum. Heated, the mixture must give off mercury and hydrochloric acid, and then these, as in the Japanese process, will, with air, give the calomel, but this is independent of the previous intimate mixture of the mercury with the salt and the alum. Another point is that in place of the magnesium chloride of sea water as the source of hydrochloric acid, the Chinese are said to use alum or copperas, which, with the salt, will react to give hydrochloric acid. A third point is that the cover is said to be closely luted to the iron pot, which must nearly exclude the air, without which it is impossible to explain the formation of the calomel. Perhaps this is the reason why the Chinese process is said to take four or five hours' firing, since this may give time enough for the needed oxygen to diffuse through the cup and luting, it will also account for the fact, if it is one, that the yield of calomel is markedly less in weight than the mercury used. Again, there are to be noticed the statements that the iron pot is exposed for hours to the strong heat of a charcoal fire, and that the hot clay cover is cooled by throwing cold water on it, statements which must be regarded as greatly exaggerated if not erroneous. Lastly, the calomel-giving vapors are allowed to remain in contact with the hot iron of the pot, instead of being kept from it by the thick lining of earth provided in the Japanese process, a contact which such vapors could not stand without destruction. I think, therefore, that we may be fairly doubtful whether any reliable description has yet been given concerning the Chinese process, which we may expect to find to differ little, if at all, from the Japanese process, except in salt and alum being used in place of the mother-liquor of sea-salt or "water," as Ono Ranzan supposed it to be.

One thing to which attention may be called is that the Chinese are stated to add some nitre to a similar mixture when employed to give corrosive sublimate. For that being the case, it is seen that free chlorine which would here be developed from the salt, nitre and alum, is necessary for the production of the higher chloride, and that air and hydrochloric acid can only yield the lower chloride, a difference of much theoretical interest, and indeed of practical moment also. It is known that re-sublimation of calomel generates some corrosive sublimate, and, although authorities are not quite agreed as as to whether reaction occurs between gold leaf and calomel vapor, it is hardly to be doubted that such reaction does occur. Now I have found that if in the Japanese apparatus the temperature of the cover be raised sufficiently to volatilize much of the calomel the remaining calomel is no longer free from corrosive sublimate. It must, therefore, be borne in mind that the calomel formed in the Japanese process is not, and cannot be, the result of true sublimation, but of precipitation as fast as formed from the three gaseous bodies which give rise to it. At the temperature at which mercury boils, calomel is either quite fixed or, at most, has a vapor of exceedingly small tension. In the two facts, that the three gases do not react to yield corrosive sublimate and that the calomel is not heated to its volatilizing point, lie the explanation and, at the same time, the assurance that Japanese (and Chinese) calomel contains no corrosive sublimate.

Summary.—The Japanese prepare calomel pure, above all things free from corrosive sublimate. They heat balls of porous earth and salt soaked in bittern along with mercury, in iron pots lined with earth. The heat forms hydrochloric acid from the magnesium chloride in the bittern, and the mercury sublimes into the closely-fitting but unattached clay covers of the pots. Air enters by diffusion and oxygen and hydrochloric acid gas act together in the hollow cover on the vapor given off from the sublimate of mercury there formed. The cover thus becomes filled with a network of micaceous particles of calomel, precipitated at a temperature below its subliming point at the moment of its formation.

This investigation of an interesting product of Japanese industry has been carried out under the authority of the Imperial University of Japan. I cannot acknowledge fully enough the indispensable assistance I have received from my colleague, Assistant-Professor Haga, F.C.S.

RECENT CONTRIBUTIONS TO PHARMACY.

Observations of a Pharmacognosist in England.—Under the above caption Prof. Henry H. Rusby delivered recently a very interesting address before the Alumni Association of the New York College of Pharmacy, (*Alumni Journal*, 1894, 49). After expressing his appreciation of the privileges extended to him of working on the Kew Herbarium, he records certain conclusions relative to *Cinchona Calisaya* which are sure to excite comment. Premising his conclusions with the statement that his attempts to determine certain Bolivian forms of Cinchona had resulted somewhat unsatisfactorily in the past, and that there seemed to be a clear discrepancy between his results and the current determinations of different species, he expresses the belief that the Kew specimens of *Cinchona Calisaya* are all wrongly named, notwithstanding the fact that the correctness of this conclusion involves the wrong naming of millions of trees at all the centres of Cinchona cultivation outside of America, at the time that those localities contributed their specimens to Kew.

In arriving at this conclusion, Prof. Rusby was governed by a specimen of *Cinchona Calisaya*, shown him, while in London, by Mr. Howard, a grandson of the famous quinologist. The specimen examined was an original one from which Mr. Weddell had drawn up his description of *Cinchona Calisaya*. It was exactly as Prof. Rusby had pictured it, and corresponded with not more than three or four of the entire collection of specimens so named at Kew. Therefore he emphatically states that the plant called *Cinchona Calisaya* var. *Josephiana* has been enormously cultivated and distributed to herbaria under the name of *Cinchona Calisaya*. He further says that if the plant were in reality a variety of the species to which it is accredited, the error would be less grave; but it is, in all essential characters, and particularly in its economic aspects, as distinct from *Cinchona Calisaya* as it well could be.

Certain other statements are also of especial interest: Rhaponticum or spurious rhubarb is largely grown in England, and the belief is expressed that an important branch of the business is in the shipping of this article to American ports.

Carthagena ipecac is supposed to be rigidly excluded from our market, yet it is stated that very direct and definite evidence exists that a regular business exists in London of "picking over the Carthagena ipecac, selecting certain roots, breaking off certain

parts of them, when necessary, and staining the suitable portions in imitation of the Rio variety, for the purpose of evading our custom house officers."

Senna pods are now sold in the London markets, and, contrary to the old belief, they have been found to have the same properties, and to be probably little, if any, inferior to Senna leaves.

Wild mace, a product of *Myristica Malabarica*, and almost entirely devoid of aromatic properties, is largely sold; for what use, it is not stated.

In conclusion, Prof. Rusby refers to a visit to the famous Meacham Drug Farms. The soil is chalky, which is believed to favor the development of volatile oils in plants. Large fields of peppermint, thyme and chamomile were observed. The cultivators of the plants do not themselves do the distilling, which is a separate industry. In some cases, the owners of the stills purchase the crop from the farmers, and distil it in their own interest, but ordinarily the crop is brought to them by the owners, and distilled for a toll or fee, and the product returned to them after distillation by the owner of the still.

J. W. ENGLAND.

Recent Contributions to the Knowledge of Squill.—This bulb has repeatedly been the subject of investigation, but without definitely ascertaining the several, especially the active, constituents. The older literature embraces investigations of Vogel, Lebourdais, Landerer, Bley, Wittstein, Tilloy, Mandet and Schroff, which contain so many contradictory statements that their results must have little importance. In 1878 there were prepared in Merck's laboratory three substances, concerning which only meagre statements are made: Scillipicrin, scillitoxin and scillin, the last of which was in crystalline form; according to C. Möller, the first two were proven to be heart poisons.

E. von Jarmerstedt published the first process for isolating the bitter principle: The dried red scales were digested with water on a water-bath for one to two days, the dark-brown colored decoction having an acid reaction and a very bitter taste, evaporated on a water-bath to a small volume, mixed with subacetate of lead, until the supernatant liquid gave but a slight precipitate, the latter collected on a filter and washed with hot water; the filtrate was freed from lead by the addition of dilute sulphuric acid and filtration,

neutralized with ammonia, concentrated on a water-bath, and the active constituent precipitated from neutral or faintly acid solution by an aqueous solution of tannin. The precipitate was allowed to subside, the supernatant liquid carefully decanted, and the precipitate collected on a filter; owing to the solubility of the precipitate, the excess of mother-liquor had to be removed by pressing between bibulous paper; to liberate the bitter principle the dried precipitate was treated with absolute alcohol, filtered, the filtrate mixed with zinc oxide and a little water, evaporated to dryness on a water-bath, the residue extracted again with absolute alcohol and this solution evaporated to dryness. The more or less red colored, intensely bitter residue formed a tough, sticky mass which, immersed in water, became hard and pulverizable; to remove coloring matter the powder was mixed with animal charcoal, washed repeatedly with water, and after drying the charcoal at a moderate temperature, extracting the bitter principle with absolute alcohol.

Schmiedeberg refers to this investigation and places *scillain* in the pharmocological group containing digitalin. In addition to this bitter principle there is present among other constituents a mucilage which Schmiedeberg named *sinistrin;* it is prepared by making an aqueous infusion, adding lead subacetate until precipitation ceases, filtering, removing excess of lead, precipitating sinistrin with milk of lime, washing the precipitate, decomposing it with carbon dioxide and precipitating the sinistrin by the addition of alcohol; chemical properties and percentage composition place sinistrin in the group with dextrin, differing from this, however, by being laevorotatory and in yielding by hydrolysis chiefly lævulose presumably with another optically inactive sugar.

A. Weyher von Reidemeister prepares sinistrin by macerating powdered squill with water, keeping the mixture neutral by addition of baryta; after several hours an excess of lead subacetate is added, the mixture allowed to stand until the supernatant liquid becomes clear, then filtered and the excess of lead removed by the use of hydrogen sulphide, filtered, the filtrate neutralized with sodium hydrate and decolorized by the aid of animal charcoal; the filtrate is evaporated at a temperature below 40° C., the syrupy residue mixed with alcohol, which precipitates both sinistrin and fruit sugar, and set aside for two days. The precipitate is dissolved in twice its weight of water, the solution mixed with an excess of baryta, which

removes the greater portion of the sugar, while the decanted liquid, upon the addition of alcohol, separates the barium compound of sinistrin, which is washed with absolute alcohol, powdered and dried over sulphuric acid in vacuo; by repeated solution in water and precipitation with alcohol this compound is gotten so that it will no longer reduce Fehling's solution; it is then dissolved in three times its weight of water, the solution warmed, the barium precipitated by carbon dioxide, the filtrate concentrated on a water-bath and alcohol added. The sinistrin which is precipitated is dried and purified like its barium compound. It is possible to obtain a product by this process which yields upon ignition only one and one-half per cent. ash. Unable in itself to reduce alkaline copper tartrate solutions, solutions of sinistrin, through the influence of rapidly appearing bacteria, soon possess this property. Heated with nitric acid of sp. gr. 1·12 it yields oxalic acid, but no mucic, saccharic or tartaric acid; yeast only slowly induces fermentation.

Riche and Remont have also described sinistrin under the name of scillin, and obtained it by the expression of fresh squill, which they claim contains more scillin (sinistrin) than the dried bulbs; they obtained from fresh squill (containing about 75 per cent. water) almost 30 per cent., calculated to perfectly dry squill. The expressed juice was neutralized with chalk and evaporated under reduced pressure, to syrupy consistence; by the addition of an equal volume of alcohol they separated mucilage, and in the clear decanted liquid the addition of six volumes of alcohol precipitated the sinistrin, which was freed from sugar and inorganic salts by repeatedly dissolving in water and precipitating with alcohol; so purified, it did not yield mucic acid by boiling with nitric acid.

Franz Kurtz, in a recent inaugural dissertation, presented to the university at Erlangen, makes an investigation of the bitter principle scillain and the carbohydrates. In a study of von Jarmerstedt's method of extracting the bitter principle from both fresh and dried bulbs, mention is made of the relatively small yield; the difficulty of extracting the tannin compound of the bitter principle with alcohol because this is so tenacious that it cannot be powdered; and the prolonged exposure of the bitter principle to numerous reagents. To determine the most suitable solvent for the bitter principle, extractions were made with distilled water, hot 90 per cent. alcohol and ether; alcohol proved the best solvent, also extracting but traces of

inorganic substances; the hot alcoholic extraction of the dried bulb upon cooling deposited a substance to be mentioned later. The aqueous extraction contained no volatile acids, but oxalic, malic and citric acids were identified.

For the preparation of the bitter principle the alcoholic extract from 25 kilos. of squill was taken; the precipitate obtained in the cooling of the alcoholic extraction was collected separately. The alcoholic extract was dissolved in water and the solution heated for two days in a water-bath with elutriated lead oxide; after filtering and washing the dissolved lead was precipitated as sulphide, the excess of hydrogen sulphide removed by heat and the bitter principle removed by digestion with animal charcoal; the charcoal was collected on a filter, washed with water until the washings ceased to affect Fehling's solution, and the bitter principle dissolved out again by repeatedly boiling with absolute alcohol. The evaporation of the alcohol left a yellowish-brown residue; this by oft-repeated treatment with charcoal was finally obtained as a pale yellow, amorphous mass which, by all-known methods of solution and evaporation, could not be obtained in a crystalline form; kept *in vacuo* under phosphoric oxide it hardened and then broke with a vitreous fracture. The principle, scillain, so obtained is readily soluble in water and alcohol, especially when heated, but is difficultly soluble in ether; it has an intensely bitter taste, neutral reaction and has no effect upon alkaloidal reagents; it is free from nitrogen, not yielding a cyanide when heated with a metal, like sodium, nor yielding ammonia when heated with soda-lime. Dried to constant weight under reduced pressure and in the presence of phosphoric oxide, it has the composition C 53 80 per cent., H 7·305 per cent., O (by difference) 38 895 per cent., which, expressed in simplest proportion, would give the formula $C_6H_{10}O_3$. A concentrated aqueous solution was decomposed by warming with dilute sulphuric acid and then the solution distilled in an atmosphere of carbon dioxide by the use of steam heat; the distillate was only slightly opalescent, had an acid reaction and an agreeable odor; no test for furfurol with anilin acetate was obtainable. The distillate neutralized with sodium carbonate was agitated with ether and the two solutions separated; the ethereal solution had an agreeable odor, and upon the distillation of the ether and spontaneous evaporation of the last portions, left a neutral, pale yellow liquid, changing upon exposure

to the atmosphere; it gave no reaction with ferric chloride nor for aldehydes. Dehydrated by treatment with anhydrous copper sulphate and calcium chloride and fractionally distilled, it boiled constantly at 83° C.; odor and boiling point indicate *isopropyl alcohol.* The neutralized distillate after extraction with ether was evaporated to dryness; one of the lower organic acids was indicated by a slight charring; formic and acetic acids were not detected, but the following tests for butyric acid were obtained: Odor, formation of the ethyl ester, formation of barium butyrate by acidifying with phosphoric acid, distilling and neutralizing the distillate with barium carbonate, and estimation of barium in this salt.

The acid solution left in the retort after removing butyric acid and isopropyl alcohol by distillation had lost entirely the bitter taste; agitation with ether removed nothing from this solution. To get rid of the sulphuric acid an excess of washed barium carbonate was added, filtered, and the filtrate decolorized with animal charcoal. This solution, which reduced Fehling's solution, was evaporated to dryness and the residue boiled with methyl alcohol, filtered, and the filtrate mixed with ether; there was formed a white flocculent precipitate which dissolved in water, was dextrogyre, fermentable and gave a crystallizable compound with phenyl-hydazine melting at 205° C; it had a reducing value of 0 634 Cu for one gram substance and by oxidation yielded only oxalic acid. This bitter principle, therefore, is a glucoside decomposing into *dextrose, butyric acid* and *isopropyl alcohol.*

The bitter principle oxidized by heating on a water-bath an aqueous solution with potassium bichromate and sulphuric acid and distilling in a current of steam gave but one recognizable product, butyric acid; the green-colored liquid left in the retort, after cooling, was agitated with ether, but the latter upon evaporation left no residue.

The substance separating in the cooling of the hot alcohol extraction of the bulb is described as a dark-brown, tough, glutinous mass, readily soluble in water, but now only partly soluble in alcohol; it was boiled, using a reflux condenser, for several days with 90 per cent. alcohol, whereby the color was much improved but only partial solution was effected; after filtering, the alcohol was largely recovered by distillation, the residual liquid mixed with water, the solution first decolorized by animal charcoal, then evaporated to dryness and the sweet residue boiled with methyl alcohol. The addi-

tion of ether to this methyl alcohol solution gave a white flocculent precipitate which purified by solution and reprecipitation had the same properties (excepting the reducing value which equalled 0·649 gm. Cu) as described under one of the decomposition products of the bitter principle; this body is one of the glucose group and most probably dextrose.

The portion of the substance insoluble in methyl alcohol was easily soluble in water, the solution having the following properties: No change with iodine or Fehling's solution; it turned the plane of polarization to the left; by the action of diastase a reducing sugar was produced. Dried at 90° C, the finely powdered substance had the composition: C 44·265 per cent., H 6·175 per cent., O (by difference) 49·56 per cent., agreeing to the formula $C_6H_{10}O_5$ or a multiple of this. By prolonged heating with dilute hydrochloric acid on a water-bath laevulinic acid is produced along with humic substances; by oxidation with nitric acid either saccharic or oxalic acid can be obtained dependent upon the strength of the nitric acid. To determine if the molecule contained representatives of other related carbohydrate groups, tests were applied for laevulose, galactose and xylose, but with negative results. This investigation of the precipitate obtained from the hot alcohol extraction of squill establishes the presence of two carbohydrates, one of which is dextrose, the other is a member of the group $C_6H_{10}O_5$. .

FRANK X. MOERK.

Lanolin may be identified by the following test, which may also serve to indicate the purity of the sample: 0·1 gm. lanolin incorporated with 10 cc. concentrated sulphuric acid gives an intensely red liquid with a greenish fluorescence, the depth of color depending upon the purity of the lanolin; if 10 cc. chloroform be added to the above, agitated and allowed to separate, the chloroform layer will have a bright red color, while at the line of contact of the two liquids a black line will be noticeable; these results by comparison with pure lanolin will indicate the purity of the sample examined.—Astolfi (Boll. et. Chim. Farm.) Apotheker Ztg., 1894, 94.

EDITORIAL.

The April number of the Journal was issued so soon after the election of the present editor and publishing committee, that it was not possible to make any statement regarding the future policy of the new management.

It may now be briefly stated that the standard which brought the Journal to be the chief exponent of the scientific and professional side of pharmacy in America will not be lowered.

The editor has sought and received much sound advice from various parts of the country. The universal expression has been against any change in the dignity and scientific tone which has heretofore characterized this Journal.

With such advice before us, we are led to approach a delicate subject, and say that a large and eminently respectable element in the pharmaceutical profession does not consider that the American Journal of Pharmacy has any competitor. It occupies an otherwise sadly neglected field in the pharmacy of our country, and the effort will continue to be made to educate pharmacists to its standard, rather than lower the Journal to compete in an already overcrowded territory.

The American Journal of Pharmacy will be what the results of original work and thought from the more scientific of our profession make it. An effort will be made to largely fill its pages with original communications; after that, we propose to give brief reviews of the most recent results published elsewhere in this country and abroad.

All the most important books relating to pharmacy will be reviewed or noticed. Finally, the editor will seek some material for editorials from sources other than his own pen, hoping, thereby, to keep those few pages constantly alive and interesting.

While this Journal has a history extending back to 1825, it does not have to lean on that history for support; but the policy which gave it that history; which has placed it in many of the scientific libraries of Europe; which to-day gives it subscribers and readers in every civilized quarter of the globe, is the policy which the present management will endeavor not to deviate far from.

The first paper in this issue is a direct communication from its author, in response to a suggestion of the editor. It is hoped that this will be followed by further contributions from other honorary and corresponding members of the College.

Not only is the paper valuable in itself, but it is a hint to our readers in this country that we have thousands of indigenous plants with a local history and reputation; and some account of them, as outlined in Mr. Hooper's paper, on *Myrica Nagi*, would be of present interest, as well as of lasting value in advancing pharmaceutical knowledge.

The Martindale Herbarium.—At the meeting of the Board of Trustees of the Philadelphia College of Pharmacy, held on Tuesday afternoon, April 3d, Mr. Howard B. French, on behalf of himself and Messrs. Smith, Kline & French Company, presented to the College the entire herbarium of the late Isaac C. Martindale, of Camden, N. J., which they had recently purchased from the estate.

The chairman, Mr. T. Morris Perot, expressed the gratification of the Board

at receiving so unexpectedly such a valuable addition to the collections of the College, and accepted the same on behalf of the Board.

It is peculiarly appropriate that this superb collection of plants should be permanently located in one of the foremost educational institutes of Mr. Martindale's native city. While in recent years his attention had been largely directed to entomology, making the *Lepidoptera* a special study, the natural bent of his mind was the study of plants. Botany engaged his mind from his youth and gave him that scientific education and acquaintance with scientists which proved so valuable to him in his subsequent work.

Commencing his study of plants at the time that systematic botany alone seemed to engage almost the entire attention of botanists, his enthusiastic collections soon secured him an acquaintance with the recognized botanical authorities.

His early attempt at the preparation of an herbarium is represented by a mostly local collection mounted on sheets of paper and bound in a series of volumes. These will be preserved for their historical interest.

The present herbarium was commenced in his early manhood, and its collection and arrangement occupied at least 25 years. During a great portion of this time he enjoyed the friendship and assistance in this work of Charles F. Parker. It will always be recognized as Mr. Martindale's life work.

This collection consists of seven large walnut cases compactly filled with mounted specimens. It is impossible to form any definite idea of the number of plants contained, as on many of the sheets several specimens are attached from different localities.

Nearly every species is represented by a number of specimens from different sections of this country or from foreign countries, so as to fully represent the variations in the species.

These specimens are all handsomely mounted on white paper, and properly arranged in heavy manilla paper genus covers and in natural order divisions, the plan of arrangement adopted being that of Durand's index, corresponding with the nomenclature of the Genera Plantarum of Bentham and Hooker. The systematic arrangement and perfect order of this herbarium have always been admired by visiting botanists

Every division of systematic botany is well represented. Not only the Phanerogamia or flowering plants, but the Pteridophyta, including a magnificent collection of ferns; the mosses and liverworts, and the Thallophyta are represented by a collection of algæ, fungi and lichens. It was the aim of Mr. Martindale to make his collection complete and a representative herbarium, and it is universally acknowledged as surpassing, both in numbers and in the perfection of style and arrangement, any private collection in America.

His proximity to and knowledge of the peculiar flora of the pine barrens of New Jersey gave him a fund of material valuable for exchanges, and he was not slow to take advantage of this in obtaining valuable specimens to complete his own collection. His correspondence and exchanges were numerous, including such countries as Canada, Brazil, England, France, Germany, Austria and Scandinavia, and the flora of these are represented in the herbarium. Mr. Martindale paid considerable attention to the peculiar and miscellaneous plants of the ballast grounds, and this class, difficult of study to the ordinary student,

because not contained in our local manuals and text books, is likewise well represented.

In addition to making extensive collections himself, and exchanging with numerous botanists both at home and abroad, he acquired by purchase the best collections offered. No collector submitted a list of desirable plants but that he was made happy by an order from Mr. Martindale, and he was a liberal contributor to every botanical expedition. Among the many noted American collectors whose collections are here represented may be mentioned: Parry, Garber, Lemmon, Rothrock, Rusby, Curtis, Howell, Reynolds, Palmer, and those magnificent collections made in the Southwestern States and Territories and in Mexico by C. G. Pringle.

In 1881 he purchased the herbarium of Dr. Ferdinand Rugel, of Tennessee, which was replete in the representation of the flora of the Southern States, thus receiving a large addition to his already extensive collections from this region. These specimens were remounted and distributed through his herbarium. A great part of the herbarium of his friend and co-laborer, Charles F. Parker, who had made a special study of the flora of New Jersey, is preserved in this collection. Likewise the collections of C. F. Austin.

No expense was spared to make his herbarium complete and perfect in every respect, and the outlay was large. It is estimated that in the collection and arrangement of this magnificent herbarium Mr. Martindale had spent at least $15,000.

Beyond any statement of the money value of the herbarium, its true value will be in its importance to scientific study and future investigations. Mr. Martindale's studies brought him in contact with the botanical teachers and authorities, and numerous are the specimens bearing the labels of such eminent botanists as Dr. Asa Gray, John M. Coulter, Sereno Watson, Dr. N. L. Britton, Prof. E. L. Greene, Dr. Vasey, Prof. Macoun, Prof. Underwood, Dr. Porter and Wm. Canby.

The specimens and various genera or orders difficult of determination have been very generally submitted to specialists in these various departments, and their notes and references will add materially to the value of this collection. Many of the composites were examined and determined by Dr. Gray while preparing the volume of his Synoptical Flora of North America, covering that order.

The international reputation of this herbarium was such that monographers and students of special families of plants have eagerly availed themselves of the opportunity to consult it, and frequent are the references to its specimens in the published monographs.

In the catalogue of the plants of New Jersey, forming part of the geological survey of that State, Prof. N. L. Britton frequently refers to the herbarium of Mr. Martindale as authority for statements made.

From the above it will be seen that no just conception can be formed of its value as an authority and scientific work of reference.

It is the intention of the College to preserve the Martindale Herbarium intact as a reference herbarium, and under proper regulations it will be open to visiting botanists for study and consultation. It will thus serve alike to perpetuate the memory of a Philadelphia botanist and as a testimonial of gratitude

for such a generous gift to the donors—Howard B. French, Ph.G., and Smith, Kline & French Company. G. M. B.

The College Herbarium.—In addition to the Martindale Herbarium, the College already possesses the collections of Elias Durand, Daniel B. Smith and Prof. John M. Maisch and numerous contributions from botanical friends and students. This collection is now undergoing thorough revision by the Committee on Herbarium.

With a laboratory equipped for botanical and microscopical study, and with such an excellent herbarium for comparison, the College will now be enabled to give a more extended course of botanical instruction than heretofore.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Dictionary of the Active Principles of Plants. Alkaloids, Bitter Principles, Glucosides; their sources, nature and chemical characteristics, with tabular summary, classification of reactions, and full botanical and general indexes. By Charles E. Sohn, F.I.C., F.C.S London: Baillière, Tindall & Cox. Philadelphia: J. B. Lippincott Company. 1894. Pp. 194.

This work comprises, in a compact form, very valuable information concerning nearly six hundred plant principles; and, by abbreviating and classifying, the author has succeeded in getting into a moderate-sized volume a great deal that the pharmacist is constantly wishing to know.

No work, since the English translation of Dragendorff's Plant Analysis appeared ten years ago, comes so near supplying the demand for classified information concerning plant compounds as this does.

We may take *cocaine* as a random illustration; at a glance we see its botanical origin, and the geographical distribution of the plant from which it is obtained; the abbreviation "A" shows it to be an alkaloid; its chemical composition and compact formula are next given; then certain physical properties, as melting point and solubilities; finally, its behavior towards upward of twenty precipitants, and half as many more reagents which produce color tests. Every one having to do with the active principles of plants will find this book a constant assistant in the laboratory.

Formulaire des Alcaloides et des Glucosides. Par H. Bocquillon-Limousin. Avec une introduction par G. Hayem. Paris: J. B. Baillière et Fils. 1894. 16mo. Pp. viii et 313. Formulary of Alkaloids and Glucosides.

Three books of a series by the same author are now before us; two are reviewed at this time; the other—a Formulary on Antiseptics and Disinfectants—was noticed in this Journal, 1893, page 647.

All are useful works, but this volume on alkaloids and glucosides appears to especially comprise a large amount of valuable information, concentrated into a very small space. It is divided into three parts. (1) The Alkaloids; (2) the Glucosides; (3) the Bitter Principles and Neutral Bodies. Each class of compounds is first considered in a general way; that is, defined, the history given, classified, etc., and then the individual principles are taken up alphabetically.

The formula, when known, is first given, then the origin, method of preparation, description, reactions, therapeutic action, method of administration and dose, follow in order. Under "mode of administration" are noted a number of working formulas; for instance, with *aconitine* are given processes for making the solution, oleate, pill, ointment and tincture.

A very useful chapter is that on artificial alkaloids, beginning with *antipyrine* and ending with *trimethylamine*; much the same treatment is accorded these, that is given to the natural alkaloids.

The glucosides are described similarly to the alkaloids. While the existence of some individual members in both classes may at this time be questioned, yet, if a claim of their discovery has been made, perhaps one of the surest ways of getting more light on the subject is to introduce them into a list of this kind.

Formulaire des Médicaments Nouveaux et des Médications Nouvelles. Pour 1894. Par H. Bocquillon-Limousin. Introduction par le Dr. Huchard. Cinquième édition. Paris: J. B. Baillière et Fils. 1894. 16mo. Pp. 314. Formulary of New Remedies and Novel Medications for 1894. Fifth edition.

The characteristic features of this work are a number of brief but well-chosen descriptions of many of the newer synthetic compounds, and of some of our indigenous plants which are here used in domestic practice, but in France are considered rareties.

The most important additions to the fifth edition are: Abrine, Agathine, Alumnol, Antispasmine, Benzonaphthol, Betol, Cardine, Chloralose, Cresolal, Dulcine, Eucalyptol, Extracts of Animal Organs (of which those from the brain, pancreas and testicles are examples), Formalin, Gallanol, Gallobromal, Hydrastinine, Kola, Pental, Piperazine, Scopalamine, Salts of Strontium, Thiosinamine, Tolypyrine, Trional and Uropherine. A short article is devoted to "American Fluid Extracts," in which a general process for their manufacture is given.

The descriptions of the individual compounds described are quite comprehensive, detailing in the case of a plant, the origin, description, composition, physiological and therapeutic properties, mode of employment and dose. In the synthetic remedies a method of preparation is included in most cases.

A few inaccuracies are noticed, as alum root for the synonym of *Geranium maculatum*, and *Gelsemium* is given as a member of the natural order *Solanaceæ*. Extended reviews of the earlier editions were given in this Journal.

Minnesota Botanical Studies. Bulletin No. 9, Part II, from the Geological and Natural History Survey of Minnesota. Conway MacMillan, State Botanist.

The Graduate, a periodical journal devoted to Pharmacal Education. Published under the direction of the Alumni Association of the Chicago College of Pharmacy.

The first issue of this publication occurred in April, 1893; a second number is now before us. It is devoted to many interesting topics concerning pharmacy, the most commendable of which is an Analysis of *Geranium Maculatum* by Ernest H. Stolz. We are glad to note that he calls attention to the common error which declares that geranium should be collected in autumn, while it has been shown that it is richest in tannin just before flowering in April or May.

The Alumni Journal. Published by the Alumni Association of the College of Pharmacy of the City of New York.

The third number of this monthly publication has reached us. The first number appeared early in the year, and the Journal bids fair to become a factor in the history of the New York College of Pharmacy. Where devoted to the diffusion of pharmaceutical knowledge, and placing it before the profession in its most acceptable form, we cannot have too many of these publications. Henry Kraemer is editor, with an unusually strong corps of assistants and associates.

No one interested in the profession of pharmacy will make a mistake in subscribing the small sum necessary to secure this Journal.

MINUTES OF THE PHARMACEUTICAL MEETING.

PHILADELPHIA, April 17, 1894.

The stated pharmaceutical meeting of the College was held this day, Thomas M. Newbold being called to the chair.

On motion, the reading of the minutes of the last meeting were dispensed with.

In consequence of the museum being occupied by the carpenters who were erecting new cases for the College herbarium collections of the late Daniel B. Smith and Elias Durand, the meeting was held in the Chemical lecture room.

A copy of Flückiger's monograph on the Cinchonas, translated by F. B. Power, was presented to the library, and a copy of the Extra Pharmacopœia, by Wm. Martindale, London, was presented by Prof. Remington, on behalf of the author, to whom the thanks of the College were returned.

Professor Trimble read a paper, from David Hooper, of Ootacamund, India, on *Myrica Nagi*, known under several common names as, Box Myrtle, Kaiphal, etc. The bark is used as a dye or stain of a light pink color; it is found in the various drug stores of Northern India as a remedial agent, being used for catarrhs. It is considered, when mixed with ginger, one of the best remedies for cholera, as it is astringent, carminative and tonic; the tannin seems to be associated with mineral bases. Prof. Trimble said he expected to receive some of the bark, but as yet it had not reached him.

Mr. Beringer expressed the hope the fruit and flowers would be obtained, as it is described as a fleshy fruit, which is unusual.

Specimens of the several species of *Myrica* which belonged to the Martindale Herbarium were displayed on the lecture table for comparison.

Mr. Beringer read a very interesting paper upon the genus *Myrica*, giving the appearance, uses and therapeutic properties. According to Schimmel & Co., it contained one-eighth of one per cent. of volatile oil. It will be noticed that a number of the herbarium specimens were of much larger leaf than those commonly growing around us.

Prof. Trimble stated that Mr. Manger, who examined the plant chemically, found two crystalline principles in it besides the tannin, and that an extract had lately been sent out from India under the name of Kino, and was thought to be used as such. On motion, both papers were referred to the Publication Committee.

Prof. Trimble said he had lately received a preliminary paper from Prof. Sayre on American-grown Colocynth; this was grown under the direction of C. B. Allaire, Ph.G., from seeds supplied by Dr. E. R. Squibb. The gourds were unusually large, measuring from sixteen to twenty-one-and-a-half inches in circumference. The quantity of seeds was also much greater, being between five and six hundred, while the foreign had but three or four hundred.

Dr. H. W. Jayne sent a short paper on Terebene, which was read. The question was raised whether it was worth while to continue the treatment of the oil of turpentine until it was entirely inactive, as it has been found to be remedially valuable when it still contained three per cent. of turpentine; to render this last totally inactive would greatly enhance the cost without a corresponding improvement in its therapeutic value.

A paper upon animal and vegetable ferments, by Mr. Wm. B. Thompson, was read, and it, with the last-named paper, was referred to the Committee on Publication.

There being no further business, an adjournment was ordered.

T. S. WIEGAND, *Registrar.*

PHARMACEUTICAL COLLEGES AND ASSOCIATIONS.

Philadelphia College of Pharmacy—Junior Examination.—The examinations of the Junior students during the past term were on the following subjects:

PHARMACY.

A—(1) State the requirements necessary in the construction of a good balance for weighing. (2) How may its sensibility be increased or diminished? (3) Why should the arms of a single-beam balance be equal? (4) How would you test a balance?

B—(1) Define distillation. (2) Describe the difference between the alembic and the retort. (3) Describe the various forms of condensers, and state the advantages or disadvantages of each.

C—(1) Define desiccation and evaporation. (2) State how the former facilitates comminution. (3) What kinds of vessels should be used in evaporating above and below the boiling point?

D—(1) Describe the difference between simple solution and chemical solution. (2) What is a saturated solution? (3) Under what circumstances can a saturated solution be used as a solvent?

E—(1) Describe precipitation. (2) State the principal objects of the process, and how heavy and light precipitates may be obtained.

F—(1) How is the antidote to arsenical poisoning prepared? (2) State in detail how you would proceed if called upon to act very promptly in preparing the antidote.

G—(1) Name the systems in crystallography. (2) State the principles upon which the processes of crystallizing from hot saturated solutions depend. (3) How can large or small crystals be obtained at will?

H—(Answers to the following by the U.S.P. of 1880 or U.S.P. of 1890 will be accepted.) (1) What is official syrup? (2) What are the tests of impurity of the ingredients? (3) What methods are employed by the Pharmacopœia

for making official syrups? (4) Give the official names of a syrup made by each of the methods described. (5) How would you distinguish syrup from glycerin? (6) In what respects does honey differ from syrup in its components? (7) Why is honey less used than formerly, as an official vehicle for administering remedies.

I—(1) What is the specific gravity of mercury? (2) How many grains of mercury would a bottle hold which contains exactly one fluidounce of water? (3) Give the official names of two chlorides of mercury. (4) Why were the chlorides so named? (5) What is the antidote for mercuric chloride? (6) Describe the appearance of each chloride. (7) By what means does the manufacturer secure the difference in the appearance of the two chlorides? (8) What is the dose of each chloride?

CHEMISTRY.

A—(1) Describe the construction of the mercurial thermometers. (2) What are the two thermometer scales in current use for chemical work?

B—Change 7° F. into the corresponding C.° reading. Change 79° C. into the corresponding F.° reading.

NOTE.—Please put all figures and calculations upon the paper.

C—(1) What is a prism? (2) What is the effect of a prism when placed in the path of a ray of white light? (3) What is the practical application of this for the chemist?

D—(1) Describe the decomposition of water by sodium or potassium. Write the chemical equation for this decomposition. (2) Describe the preparation of hydrogen by the aid of metallic zinc. Write the chemical equation for this reaction. (3) For what elements has hydrogen the strongest affinity? Mention experiments in illustration of this.

E—(1) Describe the element bromine, state whence it is obtained, and give a reaction for its production. (2) What are the compounds of bromine and the metals called? Describe several of these compounds of pharmaceutical importance. (3) How would you show that these compounds contained bromine?

F—(1) Give an outline of the manufacture of sulphuric acid on a large scale. (2) Write the chemical formulas of the following compounds: Sodium sulphate, acid potassium sulphate, magnesium sulphate, ferrous sulphate, ferric sulphate, Nordhausen sulphuric acid.

G—(1) State how carbon monoxide and carbon dioxide are made respectively. (2) Enumerate the points of difference by which they can be distinguished from each other. (3) Is there any acid formed from either of them? If so, give the chemical formula or formulas.

BOTANY AND MATERIA MEDICA.

A—Organs of Plants. (1) Name a kind of plant which does not possess distinct organs. (2) Into what two classes are the organs of the higher plants divided with respect to their uses? (3) Name the members of each class. (4) Of the organs of vegetation, which are axial and which appendicular?

B—The Root. (1) State three of the most important characteristics of the root. (2) Define an adventitious root. (3) What two important uses have ordinary roots? (4) Name two uses other than the ordinary ones that roots

may have. (5) Draw a diagram of a fusiform root, pointing out the head, neck and root proper.

C—The Stem. (1) How does a stem differ from a root (a) in the appendages it bears and (b) in its mode of growing in length? (2) What organs must every bud include? (3) At what points on a stem do buds regularly appear? (4) Define a supernumerary bud. (5) What name would you apply to such a stem as that of the wheat or corn? (6) How would you distinguish a rhizome from a root?

D—Phyllotaxy. (1) In the ⅜ phyllotaxy, what is the angular distance in degrees from one leaf to the next one in the same cycle? (2) How many vertical rows of leaves or orthostichies on a stem having the $\frac{5}{13}$ phyllotaxy? (3) Suppose the first two members of a series of alternate phyllotaxies were ⅓ and ¼, what would the next number of the series be?

E—Leaf Forms. (1) Draw a leaf which is described as follows: petiolate, exstipulate, lamina spatulate, apex emarginate, base obtuse, margin entire. (2) How many leaflets in a quadrate leaf? (3) How many leaflets has a quadriternate leaf?

F—Anthotaxy. (1) Name the two principal types of anthotaxy, and state how they differ from each other. (2) Give the names appropriate to each of the following kinds of flower clusters: that of the carrot, that of the sunflower, that of the currant, that of the forget-me-not, and that of the Indian turnip. (3) Name a familiar plant whose flowers are arranged in verticillasters.

G—(1) In what three different ways may anthers be inserted on their filaments? (2) Define an introrse anther. (3) Draw a diagram of a cross-section of a three carpelled, unilocular ovary whose placentation is marginal. (4) What are entomophilous flowers? (5) Give the appropriate botanical names of each of the following fruits: a plum, a grain of wheat, and a lemon. (6) Name a fruit that is a silique, one that is a sorosis, and one that is a tryma. (7) What two scars occur on every seed? (8) Write the botanical names of two plants belonging to the thallophyta, and state the class to which each belongs. (9) To what series, class and sub-class do each of the following plants belong: barley, spruce, fern and potato? (10) Name what seem to you the three most important characteristics of dicotyls, besides the fact that their embryos are dicotyledonous.

H—(1) Write the U.S.P. names of two very potent alkaloidal leaf-drugs, giving also the name of the principal alkaloid in each case. (2) Write the common names of the drugs that contain, respectively, the following active principles: cathartic acid, hygrine and artanthic acid. (3) Write the botanical names of three plants yielding leaf or flower drugs possessing the following properties, respectively: sialagogue, mydriatic and expectorant. (4) State what seems to you the one most characteristic structural difference between matricaria and anthemis. (5) Write the U.S.P. names of three leaf-drugs in which the leaves are punctate with internal glands. (6) Write the common name of a drug studied in this course that owes its activity wholly or largely to the presence of a volatile alkaloid. (7) Write the official names of two diuretic-tonic leaf-drugs derived from different natural orders, naming the natural orders in each case. (8) From what natural orders are the following drugs respectively derived: eucalyptus, coca and thea? (9) Name four different drugs that contain caffeine. (10) What poisonous drug studied in this

course owes its activity to the presence of a volatile acid? Write the botanical name and natural order of the plant.

EXAMINING COMMITTEE.

A—What is the meaning of the following botanical terms: Polypetalous, Gamopetalous, Apetalous? Under which of these divisions would the plants yielding the following official drugs be found: red rose, arnica, elder, kousso, calendula.

B—Give the formula for nitric acid. Describe three tests for distinguishing it. What are the compounds of nitric acid with the metals called? Name an official salt of nitric acid.

C—Give the weight in grams of each ingredient of a mixture as follows: Half a liter of ether, sp. gr. 0·725;750 cubic centimeters of alcohol, sp. gr. 0·820; two liters of glycerin, sp. gr. 1·250; five deciliters of oil of turpentine, sp. gr. 0·855; and 100 cubic centimeters of chloroform, sp. gr. 1·490. Give also the total weight of the mixture, expressed metrically.

D—(1) What is Fowler's Solution? (2) Give its official name. (3) Give its English name. (4) How is it made? (5) What is its dose expressed in apothecaries' measure? (6) What is its dose expressed metrically? (7) Name two official antidotes for this solution. (8, 9) Give the method of preparing each. (10) Upon what does the efficiency of these antidotes depend?

OPERATIVE PHARMACY.

On Saturday, March 3, 1894, the Junior examination in operative pharmacy was held. 349 candidates were present. The work exacted was the making of camphor water, ointment of red mercuric oxide, and granulated sodium salicylate.

SPECIMENS.

At the final examination on March 10th, ten specimens representing the above branches were given to the class for identification.

SENIOR EXAMINATION.

The examination of the senior class for the degree of Graduate in Pharmacy, commenced March 20th, and was continued until March 27th. The following questions were submitted to each candidate:

PHARMACY.

A—(1) Express in figures fifty-seven cubic meters, fifty-seven cubic decimeters, fifty-seven cubic centimeters, fifty-seven cubic millimeters. (2) Having purchased five kilos of "Gum Opium," assaying 10·5 per cent. morphine, I find that it loses twenty-five per cent. of moisture on drying. How much morphine per cent. will it contain when dry? (3) How many pints of official tincture of opium will this dried opium make? (No allowance for loss in powdering.)

B—Give the unabbreviated official or Latin name, ingredients, brief outline of process, and describe the appearance of: Essence of spearmint, spirit of mindererus, volatile liniment, carron oil, bay rum, blistering cerate, turpeth mineral and basilicon ointment.

C—Give the English name, ingredients, brief outline of process, describe the appearance of: Emulsum chloroformi, liquor acidi arsenosi, infusum sennæ compositum, syrupus acidi hydriodici, tinctura ipecacuanhæ et opii, pilulæ phosphori, pulvis effervescens compositus and confectio sennæ.

D—(1) How is spiritus ætheris nitrosi made by the U.S.P., 1890, process? (2) Name the compound which the Pharmacopœia recognizes as the valuable constituent in this spirit. What is its boiling point? (3) Give the official test for this constituent. (4) What is the specific gravity of spiritus ætheris nitrosi? What are its common adulterations?

E—Give the color tests for the following: (1) The aloins. (2) Quinine. (3) Strychnine.

F—Define chemical, physical and therapeutical incompatibility, and write three prescriptions, giving correct metric doses, illustrating each kind of incompatibility. (1) Chemical incompatibility, (2) physical incompatibility, (3) therapeutical incompatibility.

G—(1) In compounding prescriptions, state under what circumstances it is advantageous to aid the solution of a solid by heating it with the solvent. (2) State when it is proper to filter a prescribed liquid preparation, and explain why, for certain reasons, filtration sometimes should not be resorted to. (3) When is it permissible to make an addition to a prescription without the consent of the prescriber? Give reasons for your answer. (4) Is it desirable, when renewing a prescription, to follow the order of mixing the ingredients originally used? If so, why?

H—(1) How is wafer-paper or wafer-sheet made? (2) Upon what property does its usefulness in administering powders depend. (3) Describe the method of using wafer-paper in making cachets. (4) Describe or draw a sketch of an apparatus for filling and sealing cachets. (5) How are tablet-triturates made? (6) How may these be made harder in consistence without affecting their usefulness?

I—(1) What is gelatin? (2) How is it made? (3) What classes of gelatin capsules are found in commerce? (4) Draw a sketch illustrating each class. (5) Describe the manufacturers' methods of filling capsules with liquids. (6) How may capsules be filled on the small scale by pharmacists? (7) How may the gelatin mass used for capsules be made to vary so as to produce capsules of different consistence?

K—(1) What substances are directed to be used in making official suppositories, U.S.P., 1890? (2) What physical properties are necessary to constitute a good suppository mass? (3) Describe the method of making rolled suppositories. (4) Describe the method of making moulded suppositories.

CHEMISTRY.

A—(1) What are the sources of the element sulphur? (2) What are the chief technical uses of sulphur? (3) Describe the official varieties of sulphur. (4) Enumerate the oxides and acids of sulphur, giving the exact chemical names and formulas. (5) By what tests would you be able to distinguish a metallic sulphide from a metallic oxide?

B—(1) How is metallic sodium made at present? (2) Give the reactions for the several commercial processes for making *sal soda*. (3) Mention the most abundant natural sodium salts, and state how and where they occur. (4) Give the formulas for *sodii carbonas, sodii boras, sodii phosphas, sodii pyrophosphas, sodii hypophosphis, sodii nitris.*

C—(1) Mention the chief ores of lead, and state how the metal is extracted from them. (2) What are the technical uses of metallic lead and of its alloys?

(3) Name the several oxides of lead, give their formulas, describe their appearance, and state their technical uses. (4) How is white lead made? (5) Give the formulas of *plumbi acetas, plumbi carbonas, plumbi iodidum.*

D—(1) How is *potassii bichromas* made? (2) What takes place when an excess of sulphuric acid is added to its concentrated aqueous solution? (3) Describe the pharmacopœial tests for this salt. (4) What chemical changes take place in each of these cases? (5) What pigments may be formed from *potassii bichromas?*

E—(1) Mention the most important ores of iron. (2) Give an outline of the process of extracting the metal from the ore. (3) What are the several varieties of commercial iron, and in what respects do they differ physically and chemically? (4) Give the formulas of the several sulphates of iron recognized in the Pharmacopœia, with the proper chemical names corresponding. (5) State how you can change a ferrous solution into a ferric one, and *vice versa.*

F—(1) What is an ether? Give the formula of an official ether. (2) What is an ester? Give the formula of an official ester. (3) What is an aldehyde? Give the formula of an official aldehyde. (4) What is a fatty acid? Give the formula of official fatty acid. (5) What is an amide? Give the formula of an official amide.

G—(1) Give the classification of the carbohydrates. (2) State what are the distinctive differences in formulas and reactions between the several classes. (3) What are the commercial sources of cane sugar, and what is their relative importance? (4) How can you distinguish between *saccharum* and *saccharum lactis?* (5) Give an account of the more important industries based upon cellulose.

H—(1) Show by graphic formulas the difference between a phenol and an aromatic alcohol. (2) Show by graphic formulas the difference between an aromatic acid and a phenol acid. (3) Give the formulas of two official phenol acids. (4) Give the formulas of two official phenols. (5) Give the formula and proper chemical name of salol.

I—(1) Describe naphthalene, state its sources and how extracted and purified. (2) Write the graphic formula of β-naphthol. (3) Write the graphic formula of α-naphthylamine. (4) Write the graphic formula of α-naphthoic acid. (5) What basic nitrogenous compound corresponds closely in formula with naphthalene?

K—(1) What are essential oils? (2) In what respects, physical and chemical, do they differ from the fixed oils? (3) How are they obtained from the substance in which they occur? (4) State the most important classes of constituents that occur in them, giving the chemical distinctions between them. (5) Mention some of the most important of the essential oils, and give their practical uses, both pharmaceutical and technical.

MATERIA MEDICA AND BOTANY.

A—(1) Write the U.S.P. or official names of three monocotyl drugs—one a root-drug, one a rhizome-drug and one an inspissated-juice drug. (2) The following are the botanical names of plants yielding official drugs: Fraxinus ornus, claviceps purpurea and asagræa officinalis. What is the official part and what the official name of the drug in each case?

B—(3) Write the names of two root-drugs that in overdoses act as narcotic poisons. (4) Write the name of the most important constituent in each of two

poisonous rhizome drugs that are official. (5) Name three different plants in which the alkaloid berberine is known to occur.

C—(6) Name three powerfully sialagogue official drugs—one a bark, one a root and one a leaf. (7) Write the names of two cholagogue drugs—one a rhizome and one an inspissated juice.

D—(8) What drugs contain the following principles, respectively: Emetine, pelletierine and jervine. (9) Write the name of a powerfully sudorific leaf-drug, of a powerfully tetanizing seed-drug, and of a powerfully febrifuge bark drug, each of which is official.

E—(10) Name a bark-drug which, when moistened and applied to the skin, produces vesication. (11) Name three very potent vegetable principles not alkaloidal, each derived from a different drug. (12) Name a rubefacient fruit-drug, a rubefacient seed-drug and a rubefacient root-drug.

F—(13) What official bark-drug, when macerated in water, emits an odor like that of bitter almonds? (14) What fruit-drug, when ground up with a solution of caustic alkali, emits an odor like that of mice? (15) What official bark-drug emits a faint odor of valerianic acid?

G—(16) Name three official drugs that owe their activities wholly or chiefly to the presence of volatile alkaloids. (17) Name three official drugs which are powerfully tonic to heart muscles. (18) Name three official drugs that powerfully depress the heart's action.

H—(19) Write the botanical names of the plants that yield the following, respectively: Lupulinum, kamala and picrotoxinum. (20) Two official bark-drugs are distinguished from all others by the fact that they turn deep red when a solution of caustic potassa is applied to their inner surface. Name the barks.

I—(21) What official fruit-drug from the umbelliferæ possesses no oil-tubes? (22) Name two official drugs which in the dry form are destitute of volatile oils, but which on maceration in water and distillation yield potent ones. (23) Name a seed-drug from the euphorbiacæ which by simple pressure yields a vesicant and drastic fixed oil that is official.

K—(24) Write the name of a cryptogamous-spore drug, of a gum-resinous umbelliferous drug, and of an oleo-resinous coniferous drug, each of which is official. (25) Classify the volatile oils and name an example of each class.

EXAMINING COMMITTEE.

A—(1) Give unabbreviated official name, specific gravity, and symbol of mercury. (2) Name some of the localities from which it is obtained. (3) In what combination does mercury usually exist in nature? (4) What process is generally used in separating it from this combination? (5) What two series of salts are formed by mercury? (6) To which series does corrosive sublimate belong? (7) Write the chemical formula and state the dose of corrosive sublimate. (8) Give the chemical formula of calomel. (9) Give a test for the presence of corrosive sublimate in calomel. (10) Name the official preparations in which mercury enters in the metallic state, giving the percentage of mercury in each.

B—(1) What is the difference between a granulated salt and one which is powdered? (2) Explain the cause of the formation of lumps during the process of granulation. (3) State how they may be avoided without resorting to

trituration. (4) How are granulated effervescing salts made? (5) What advantages are gained by the administration of remedies in this form? (6) Give an outline of the formulas of two official granulated effervescent salts. (7) Name one or more common household chemicals which are usually seen in the granular form.

C—(1) Give the official name of Calabar bean. (2) Give the botanical name of the plant. (3) Where is this plant indigenous? (4) What two names have been given to the active principle of Calabar bean? (5) What salts of the active principle are official? (6) What is the dose of these salts? (7) What preparations of Calabar bean are official? (8) What menstruum is used to exhaust the bean? (9) Give the dose of each preparation. (10) What are the medical properties of Calabar beans?

D—Give the English name or synonym, ingredients, brief outline of process, and describe the appearance of: liq. ferri et ammonii acetatis, pilulæ rhei compositæ, syrupus ipecacuanhæ, unguentum diachylon, tinctura gentianæ composita, vinum antimonii, emplastrum picis cantharidatum and spiritus juniperi compositus.

E—(1) How many cc. of distilled water would be required to weigh as much as five liters of a mixture of two parts of official glycerin and three parts of official alcohol? (No allowance for contraction.) (2) How many grams of mercury, sp. gr. 13·55, would it require to fill a 1,000 cc. measure which already contained 410 grams of official alcohol, at 15° C.?

F—(1) Give two tests for distinguishing the salts of copper and iron. (2) What three tests are used to distinguish between sulphites and thiosulphates? (3) Name three characteristic tests for lead salts. (4) What acids are used to dissolve metallic lead?

G—(1) What are fixed oils and fats chemically? (2) On boiling fixed oils or fats with potassium or sodium hydrates, what products are formed? (3) On treating fixed oils or fats with superheated steam, what official acids are produced? (4) When fixed oils or fats are oxidized by nitric acid with heat, what solid compound is formed? (5) Into what official preparation does this compound enter? (6) Into what official preparation does the sodium compound of a fatty acid enter? (7) From what source is adeps lanæ hydrosus obtained? (8) In what forms is petrolatum now official? (9) How do the "petrolatums" differ chemically from fixed oils and fats?

H—Give the maximum single dose of each of the following: (1) Diluted hydrocyanic acid. (2) Tincture of aconite. (3) Tincture of nux vomica. (4) Tincture of digitalis. (5) Tincture of belladonna. (6) Extract of opium. (7) Morphine sulphate. (8) Strychnine sulphate. (9) Codeine sulphate. (10) Atropine sulphate.

I—(1) How would you compound the following prescription?

℞ Quininæ Sulphat., gr. xxx.
Ferri Reducti, gr. xxx.
Acidi Arsenosi, gr. ii.
Ext. Belladonnæ Fld., f℥i.
Nitroglycerini, $m_{1\frac{1}{10}}$

M. ft. massæ et in pil. no. xxx. divid.

(2) Criticise this prescription. What difficulties are likely to occur and what precautions would you take to avoid them?

℞ Liq. Ammon. Acetat., f℥iv.
Acid. Acetic., f℥i.
Tinct. Ferri Chloridi, f℥ss.
Glycerini, f℥ss.
Mucilago Acaciæ q. s. ft. f℥viii.

Misce. Sig.—One teaspoonful every two hours.

K—(1) Write a prescription for thirty pills, using unabbreviated official names and expressing the quantities metrically, each pill to contain:

℞ Arsenous Acid, gr. $\frac{1}{20}$.
Aloin, gr. $\frac{1}{2}$.
Vallet's Mass, gr. iss.
Sulphate of Cinchonidine, gr. ii.

M. Sig.—One pill t. d. p. c.

Translate the directions and name the best excipient.

(2) State exactly how you would prepare the following prescription. Would you dispense it as written? Give reasons for your mode of procedure.

℞ Acidi Arsenosi, ·5.
Potassii Bicarb, 1.
Aq. Destillat., 500.
Ft. solutio sec. art.

Sig.—Let 4 cc. be given every two hours.

OPERATIVE PHARMACY.

The examination in operative pharmacy was held March 24, 1894, and consisted in making the following:

Suppositories.

Glycerin,	8 cc.
Sodium Carbonate C.P.,	0·50 gm.
Stearic Acid,	·85 gm.
Aloin,	·40 gm.

Make six suppositories. Put into bottle.

Capsules.

Cinchonine Sulph.,	1·80
Powd. Capsicum,	·60

Mix. Fill 1 doz. capsules.

Cachets.

Cinchonine Sulph.,	1·20 gm.
Powd. Capsicum,	·20 gm.

Mix. Make six powders. Put into cachets.

Plaster.

Alc. Ext. of Belladonna Leaves,	5·0 gm.
Yellow Wax,	1·5 gm.
Resin,	3·5 gm.
* Lead Plaster,	45 gm.

Make Belladonna Plaster. Label the dipper.

* The dipper contains 50 gm. of Lead Plaster.

Spread Plaster.

Spread a breast plaster about seven inches in diameter with above plaster.

ANALYTICAL CHEMISTRY.

The examination in analytical chemistry was held in the chemical laboratory on March 27th.

Each student was given two hours in which to make an analysis of a powder consisting of a mixture of three, four or five salts.

SPECIMENS.

Materia Medica: Taraxacum, Pyrethrum, Gelsemium, Sanguinaria, Podophyllum, Euonymous, Granatum, Chimaphila, Ammoniacum, Myrrha. *Chemistry:* Alcohol, Sodii Hyposulphis, Acetanilidum, Sodii Boras, Potassii Ferrocyanidum, Potassii et Sodii Tartras, Naphtalinum, Sodii Bicarbonas, Sodii Chloridum, Æther Aceticus. *Pharmacy:* Aqua Creosoti, Liquor Ferri et Ammonii Acetatis, Spiritus Ætheris Compositus, Syrupus Aurantii Florum, Pulvis Rhei Compositus, Pulvis Cretæ Compositus, Syrupus Ferri Iodidi, Tinctura Gentianæ Composita, Extractum Ergotæ Fluidum, Extractum Cinchonæ Fluidum. *Committee:* Liquor Plumbi Subacetatis, Pulvis Ipecacuanhæ et Opii, Tinctura Benzoini, Extractum Sennæ Fluidum, Lupulinum, Senega, Oleum Eucalypti, Potassii Bicarbonas, Ammonii Chloridum, Ferri Oxidum Hydratum.

Seventy-third Annual Commencement. Friday Evening, April 13, 1894.— The degree of Graduate in Pharmacy, Ph.G., was conferred by the President, Charles Bullock, on the following gentlemen :

Name.	*Subject of Thesis.*	*State.*
Adams, Bentley Bryant,	*Menthol*,	New Jersey.
Ames, Charles Eugene,	*A blast furnace*,	New York.
Alter, Geo. Merchant,	*Syrupus simplex by cold percolation*,	Pennsylvania.
Atkins, Frank Hean,	*Compressed tablets*,	Pennsylvania.
Aughinbaugh, Wm. Culbertson,	*The official inorganic salts*,	Maryland.
Bailey, John Henry,	*Acidum boricum*,	Pennsylvania.
Baker, George Fisher,	*Iodine*,	Pennsylvania.
Barlow, Walter Gilbert,	*Gossypium*,	Pennsylvania.
Barr, Robert Hamilton,	*Preparation of tinctures and fluid extracts*,	Pennsylvania.
Bauch, George Franklin,	*Accidents and poisoning*.	Ohio.
Beakey, George Bernard,	*Manufacturing pharmacists*,	Pennsylvania.
Benedict, William Paul,	*Camphor*,	Pennsylvania.
Bertsch, George Philip,	*Gossypium*,	Pennsylvania.

Name.	Subject of Thesis.	State.
Betz, Wm. Howard,	*The Pharmacy of emulsions,*	Pennsylvania.
Black, Charles Jeffries,	*Linum,*	Pennsylvania.
Blumhard, Chas. Albert, Jr.,	*Cotton,*	Arkansas.
Bowen, Willis Elliott,	*Assay of opium and its extract,*	New York.
Boyle, Frank Meagher,	*Kefir,*	Delaware.
Brallier, Stanley A. E.,	*Camphora,*	Pennsylvania.
Brellocks, Frederick John,	*Cypripedium pubescens,*	Pennsylvania.
Brennan, Francis Henry,	*Nickel and its preparations,*	Pennsylvania.
Britcher, Milton Weimer,	*Emulsions,*	Pennsylvania.
Brown, Daniel Edward,	*Camphor,*	Ohio.
Brown, James Reed Logan,	*Triturations,*	Pennsylvania.
Brown, Wilbur Beers,	*Thymol as a deodorant for iodoform,*	Pennsylvania.
Bunting, Frank Allison,	*Cascara sagrada,*	Pennsylvania.
Bush, Harvey Benjamin,	*Spongiæ,*	Pennsylvania.
Cameron, Frank Butler,	*Soap plants,*	Delaware.
Cappeau, Thomas Harrison,	*Serpentaria,*	Delaware.
Chalfant, Wm. Windle,	*Incompatibility,*	Pennsylvania.
Cherdron, Charles,	*Adeps lanæ,*	Ohio.
Christ, George Raymond,	*The pharmacopœias of 1820 and 1890,*	Pennsylvania.
Claudy, Robert Blean,	*Unguentum hydrargyri nitratis,*	Pennsylvania.
Craig, Harvey Alfred,	*Iodoform,*	Illinois.
Crawford, James Adam,	*Taraxacum,*	Pennsylvania.
Culley, John,	*Granatum and its tannin,*	Utah.
Dare, Charles Wilfred,	*Coccus cacti,*	New Jersey.
Davis, William,	*Camphor,*	Pennsylvania.
Daws, Wm. Ruth,	*Copaiba,*	Pennsylvania.
Deen, Frank Snyder,	*Emplastra,*	Pennsylvania.
De Ford, Charles H.,	*Boroglycerinum,*	Kansas.
Desmond, Edward,	*Black oak bark,*	Wyoming.
Dilks, Harmon, Jr.,	*Camphora,*	New Jersey.
Douglass, Wm. Tyler,	*Camphor cream,*	Pennsylvania.
Dunn, Edward Walker,	*Contribulions of coal tar to pharmacy,*	New Jersey.
Durham, John McCurdy,	*Vaseline and its tests,*	Pennsylvania.
Eakin, Henry Gray,	*Cubebs,*	Pennsylvania.
Ely, Frank William,	*Potassii bitartras,*	Pennsylvania.
Engle, Stratton R.,	*Ceylon cinnamon,*	New Jersey.
Eyer, Edward Augustus,	*Spiritus ætheris nitrosi,*	Pennsylvania.
Fackenthall, John Michael,	*Fluid extract of jalap,*	Pennsylvania.
Fishburne, Pliny,	*Hypodermic tablets,*	Virginia.
Flanagan, Thomas Francis,	*Acetic acid,*	Pennsylvania.
Fluck, Charles Lewis,	*Vanilla,*	Pennsylvania.
Fowler, Hudson DeMott,	*Ichthyol,*	Ohio.
Fraunfelder, Jacob Adam,	*Sulphur,*	Pennsylvania.
Furnell, Carl Bennett,	*The metric system,*	Maine.
Gabler, Theodore,	*Aluminium,*	Pennsylvania.
Gabrio, Frank Peter,	*Liquor sodæ,*	Pennsylvania.
Garver, Walter Joseph,	*Cod liver oil,*	Maryland.
Gebhardt, Ehrgott William,	*Obsolete pharmacy,*	Pennsylvania.
Geety, Wallace Gillespie,	*Mistura glycyrrhizæ composita,*	Pennsylvania.

Name.	*Subject of Thesis.*	*State.*
Gibson, Hiester Franklin,	*Camphor*,	Pennsylvania.
Gerlach, Herman,	*Hydrastis*,	Wisconsin.
Goico, Ernest,	*Emulsions*,	West Indies.
Gould, Josiah Cole,	*Pareira*,	Pennsylvania.
Gregory, Robert Nicholson,	*Tablet triturates*,	Florida.
Gruhler, Martin,	*Achillea millefolium*,	Pennsylvania.
Gunn, Frank,	*Opium and its alkaloids*,	Pennsylvania.
Haas, Frederick William,	*Pharmacopœial glycerites*,	Pennsylvania.
Haenchen, Emil Frank,	*Syrupus sarsaparillæ compositus*,	Pennsylvania.
Hahn, Moses Alexander,	*Tinctura opii*,	Alabama.
Hall, Thomas Murphy,	*Unguentum aqua rosæ*,	Delaware.
Hamilton, Charles Ernest,	*Gossypii radicis cortex*,	Ohio.
Harms, Herman,	*Rubus villosus*,	Utah.
Harrold, William Henry,	*Nux vomica*,	Pennsylvania.
Hatton, Thomas Mifflin,	*Fermentation*,	Pennsylvania.
Healy, Joseph,	*Aluminium*,	Pennsylvania.
Hendee, Ulysses Grant,	*Assay of powdered opium.*	New York.
Henderson, Robert Guy,	*Castanea*,	Mississippi.
Herbst, Fred. John,	*Preservation of lard*,	Pennsylvania.
Hess, Miles Roscoe,	*Sodii boras*,	Pennsylvania.
Hightower, George Almer,	*Botany of Louisiana*,	Louisiana.
Hodgson, Edwin,	*Acidum sulphuricum dilutum*,	Virginia.
Hodil, James J.,	*A word on fluid extracts*,	Pennsylvania.
Holtzhausser, George J.,	*Tœnifuges*,	Germany.
Howell, Edward Vernon,	*Rhus glabra*,	N. Carolina.
Hubley, John Hiram,	*Euphorbia pilulifera*,	Pennsylvania.
Huddleson, Frank W.,	*Kola nut*,	Dist. of Columbia.
Jackel, John Otto,	*Yerba santa*,	Pennsylvania.
Jennings, Joseph,	*Manna*,	Pennsylvania.
Jones, William Willets,	*Tincture of nux vomica*,	Pennsylvania.
Jordan, Calvin,	*The metric system*,	West Virginia.
Kachline, Frederick Wm.,	*Elixir iron, quinine and strychnine*,	West Virginia.
Kalbach, Harry Adam,	*Sapo*,	Pennsylvania.
Kappes, George Louis,	*Homœopathic pharmacy*,	Ohio.
Kelley, John Joseph,	*Tinctura opii deodorata*,	Pennsylvania.
Kenworthy, John,	*Sulphuric acid*,	Pennsylvania.
Keyes, Minor Ellery,	*Compressed powders or pills*,	Pennsylvania.
Kinsler, Lemuel Pastorius,	*Improved Blaud's pills*,	Pennsylvania.
Kirk, Lewis Richardson, Jr.,	*The magnesite of Chester County*,	Maryland.
Kirk, Samuel Bird,	*Mineral glycerin*,	Pennsylvania.
Klopp, Lewis Calvin,	*Botany, as an aid to the pharmacist*,	Pennsylvania.
Kreider, Frank Light,	*Bleaching and its agents*,	Pennsylvania.
Krumrine, Sidney,	*Absinthium, analysis of*,	Pennsylvania.
Kuhns, Edwin Jacob,	*Oleum gaultheriæ*,	Pennsylvania.
Lanterman, Bartley La Rue,	*Pills and excipients*,	New Jersey.
Le Fevre, Acton Ash,	*Camphora*,	Pennsylvania.
Light, Walter Felix,	*Olive oil*,	Pennsylvania.
Lilly, Howard Harrison,	*Kava-kava.*	Pennsylvania.
Lippincott, Jesse Diverty,	*Patent nostrums*,	New Jersey.

Name.	*Subject of Thesis.*	*State.*
Lloyd, Richard Louis,	*Hydrogen dioxide,*	Pennsylvania.
Loveland, Rowland Wayne,	*Potassium,*	Pennsylvania.
Luft, George William,	*Berberis repens,*	Utah.
Lynch, Daniel Joseph,	*Camphor,*	Pennsylvania.
McCoy, Cornelius Joseph,	*Medicated waters,*	Pennsylvania.
MacCracken, Edward Glover,	*Aristol,*	Pennsylvania.
McCreight, Charles,	*Newer remedies,*	Pennsylvania.
McHale, Frank Patrick,	*Pichi,*	Pennsylvania.
McKee, Francis Town,	*Pharmacopœia non patrons,*	Delaware.
McNeil, Harry B.,	*Fermentation,*	Maryland.
Mack, James William,	*Eucalyptus,*	Pennsylvania.
Manger, Charles Christian,	*Myrica asplenifolia,*	Missouri.
Miller, Albert Donald,	*Oleo Europœa,*	Ohio.
Mooradian, Thos. Mooshake,	*Methylic alcohol,*	Turkey.
Myers, Arnold Armstrong,	*Glycyrrhiza,*	Pennsylvania.
Myers, Henry Joseph,	*Senna,*	Pennsylvania.
Nagle, Clayton Moyer,	*Lard and its preservatives,*	Pennsylvania.
Nick, Wm. Herman Fred'k,	*Eugenia jambolana,*	Pennsylvania.
Nolan, Daniel Andrew,	*Syrups of U. S. Pharmacopœia,*	Connecticut.
Ohail, Irwin Edwin,	*Assay of extracts of nux vomica,*	Ohio.
Osborne, Albert Edgar,	*Olive oil,*	Pennsylvania.
Paschali, Theodore, Jr.,	*Silica,*	Pennsylvania.
Porter, Samuel H.,	*Zinc bromide,*	Pennsylvania.
Price, Harry Dunbavon,	*Lead, and its uses,*	Missouri.
Reinoehl, David Vogt,	*Assays of capsicum,*	Pennsylvania.
Reese, Lewis,	*Acidum citricum,*	Pennsylvania.
Rhein, Francis Xavier,	*Hydrogen peroxide,*	Ohio.
Richards, Frank Gore,	*Tinctures,*	Missouri.
Roseman, Charles Edward,	*Pepsin,*	Ohio.
Rothrock, Harry George,	*Citric acid,*	Pennsylvania.
Sage, Thomas,	*Recent antiseptics,*	New York.
Schearer, P. Weaver A.,	*Distillation of Whiskey,*	Pennsylvania.
Schuster, Joseph Bernard,	*Apiculture and its pharmacopœial products,*	New Jersey.
Scott, Charles Abbey,	*Calcium oxide,*	New York.
Sellers, Oscar William,	*Liquor magnesii citratis,*	Pennsylvania.
Sheely, Edward Valentine,	*Prescription department,*	Pennsylvania.
Shelton, Charles F.,	*Guaiaci resina,*	Ohio.
Shimer, Arthur Burton,	*Oleum morrhuæ,*	Pennsylvania.
Shoemaker, Charles Benj.	*Piscidia,*	Pennsylvania.
Smith, Beaton,	*A college of pharmacy education,*	Delaware.
Smith, James Auburn,	*Percolators,*	Ohio.
Smith, Joseph Vanest, Jr.,	*Potable water,*	Pennsylvania.
Smith, Robert Victor,	*Clarifying of liquids,*	Pennsylvania.
Sorber, Lewis Samuel,	*Mercury,*	Pennsylvania.
Spickler, Walter Scott,	*Adulteration of volatile oils,*	Pennsylvania.
Sprenger, William Alfred,	*Camphor,*	Pennsylvania.
Stevenson, Frederick Lee,	*Strophanthus,*	Maryland.
Stewart, Samuel Shelton,	*Menstruum for cocilaina,*	Ohio.

Name.	*Subject of Thesis.*	*State.*
Stout, Charles A.,	*Glycerin suppositories,*	Pennsylvania.
Sulouff, Samuel Henry,	*Copaiba, and its adulterants,*	Pennsylvania.
Taylor, Howard Davis,	*Syrups by the cold process,*	Delaware.
Taylor, Wm. Francis,	*Emulsion of cod liver oil,*	Pennsylvania.
Thayer, Houston Talbot,	*Grape fruit,*	Tennessee.
Thomas, David Walter,	*Quercus prinus,*	S. Carolina.
Tomkinson, Horace Lessy,	*Pharmacy,*	Pennsylvania.
Truckenmiller, Frank Edw.	*Mercury,*	Pennsylvania.
Vanhorn, Edward Rogers,	*Solution of ammonia,*	Iowa.
Wasley, Harry Malcolm,	*Kalmii latifolia,*	Pennsylvania.
Ward, Merton Barber,	*Zinc,*	Vermont.
Webb, Abner,	*Gossypium,*	Arkansas.
Wegener, August Gerhard,	*Saffron and its adulterations,*	Germany.
Weidler, Charles Lincoln,	*Assay of acetum opii,*	Oregon.
Whitcomb, William Higbee,	*Cocillaina,*	Michigan.
White, Ishmael James,	*Dilute hydrochloric acid,*	Maryland.
Wilcox, Wm. B.,	*Practice of ancient and modern pharmacy,*	New Jersey.
Wissler, Arthur John,	*Arsenic,*	Virginia.
Wood, George Young,	*Petroleum and its products,*	Canada.
Wood, Otis Hunter,	*Granular effervescent salts,*	Virginia.
Yerkes, Charles Markley,	*Liquor potassæ,*	Pennsylvania.
Young, Benjamin Franklin,	*Glycerin,*	Pennsylvania.
Ziegler, Howard Philip,	*Mel and apis mellifica,*	Pennsylvania.
Zimmerman, Hebert James,	*Antipyrine,*	Pennsylvania.

Total, 183.

Special certificates for Proficiency in Chemistry were awarded to Edward D. Heine, of Mississippi, and David T. Werner, of Pennsylvania.

STATES AND COUNTRIES REPRESENTED BY THE GRADUATING CLASS.

Alabama,	1	Louisiana,	1	Pennsylvania,	106
Arkansas,	2	Maine,	1	South Carolina,	1
Canada,	1	Maryland,	6	Tennessee,	1
Connecticut,	1	Michigan,	1	Turkey,	1
Delaware,	7	Missouri,	3	Utah,	3
District of Columbia,	1	Mississippi,	1	Vermont,	1
Florida,	1	New Jersey,	9	Virginia,	4
Germany,	2	New York,	6	West Virginia,	2
Illinois,	1	North Carolina,	1	West Indies,	1
Iowa,	1	Ohio,	13	Wisconsin,	1
Kansas,	1	Oregon,	1	Wyoming,	1

The honorary degree of Master in Pharmacy was conferred upon Albert E. Ebert, of Chicago, Ill.; Robert Shoemaker, of Philadelphia; and Edward R. Squibb, of Brooklyn, N. Y.

The following members of the graduating class received the grade of

DISTINGUISHED:

John Culley, Herman Harms, George Wm. Luft.

MERITORIOUS:

Chas. J. Black, Harvey Craig, Wallace G. Geety, Robert Gregory, George L. Kappes, Chas. C. Manger, Charles E. Roseman, Charles A. Scott, August G. Wegener.

The Materia Medica Prize of a Zentmayer Microscope, offered by the family of the late Prof. J. M. Maisch, for original Histological Work on American Plants, was awarded to William Higbee Whitcomb.

The Pharmacy Prize, a Gold Medal, offered by Prof. J. P. Remington, for original Pharmaceutical Work was awarded to Wm. Culbertson Aughinbaugh.

The Chemistry Prize, a Chemical Balance, offered by Prof. S. P. Sadtler, for original Quantitative Analysis, was awarded to Chas. Christian Manger. And the following graduate received honorable mention in connection therewith: John Culley.

The Analytical Chemistry Prize of $25, offered by Prof. H. Trimble, for original Chemical Work, was awarded to John Culley. And the following graduate received honorable mention in connection therewith: Chas. Christian Manger.

The John M. Maisch Prize of $20 in gold, offered by Mr. J. H. Redsecker, of Lebanon, Pa., for Histological Knowledge of Drugs, was awarded to George Franklin Bauch. The following graduates received honorable mention in connection with the John M. Maisch prize: George Wm. Luft, August Gerhard Wegener.

The Operative Pharmacy Prize, $25 in gold, offered by Mr. E. L. Boggs, Charleston, W. Va., for the best examination in Operative Pharmacy, was awarded to Lewis Reese. The following graduates received honorable mention in connection therewith: Rob't Blean Claudy, John Culley, James J. Hodil, Irvin Edwin Ohail, George Young Wood.

The Theoretical Pharmacy Prize, offered by Mr. H. J. Maris, for the best examination in Theoretical Pharmacy, was awarded to John Culley. And the following graduates received honorable mention in connection therewith: Charles Jeffries Black, Wm. Tyler Douglass, Stratton R. Engle, Ed. Augustus Eyer, Edw. Vernon Howell, Geo. Wm. Luft, Chas. Christian Manger, Edw. Rogers Van Horn, August Gerhard Wegener.

The Robinson Chemical Prize, a Gold Medal and Certificate, offered by Mr. J. S. Robinson, of Memphis, Tenn., for the best examination in General and Analytical Chemistry, was awarded to Charles Christian Manger.

The valedictory address to the graduating class was delivered by Professor Samuel P. Sadtler (see p. 227 of this issue).

The farewell supper, given by the professors to the graduating class, was held in the College Museum, Thursday evening, April 12th. The officers and trustees of the College were present, along with some other invited guests.

During the evening Mr. Wm. C. Aughinbaugh, on behalf of the Zeta Phi Society, presented an excellent crayon portrait of the late Professor Maisch; it was received for the College by Professor Sadtler.

The students also volunteered a subscription, amounting to over seventy dollars, to the electric light fund, for establishing an electric light plant by the College.

Alumni Association of the Philadelphia College of Pharmacy.—The thirtieth annual meeting of the Alumni Association was held in Alumni Hall, at the College, on Wednesday, April 11, 1894.

President David H. Ross delivered his annual address, and the Secretary and Treasurer submitted their annual reports. Appropriate action was taken on the suggestions of the President. The condition of the treasury was found to be satisfactory.

The following officers were elected:

President—Wm. Lincoln Cliffe, class '84.

First Vice-President—Jacob S. Beetem, class '78.

Second Vice-President—Dr. J. L. D. Morison, class '88.

Treasurer—Edward C. Jones, class '64.

Secretary—William E. Krewson, class '69.

Corresponding Secretary—Joseph Crawford, class '84.

Trustee of Sinking Fund—Thomas S. Wiegand, class '44.

New Members of Executive Board—Henry Trimble, '76; David H. Ross, '78; W. Nelson Stem, '73; Charles B. Hunterson, '81.

Mr. C. C. Meyer reported that a charter had just been granted to the Association.

In the evening the annual reception to the Graduating Class was held in Association Hall.

President Ross made the opening address. The class oration was delivered by Howard P. Ziegler, of Reading; the class history by George L. Kappes, of Ohio, and the future of the class by Walter J. Garver, of Maryland.

Certificate for best Junior examination was awarded to David L. Greenawalt, of Pa.

The Alumni gold medal for the highest general average in the graduating class was presented to Geo. W. Luft, of Utah.

The following gentlemen received certificates for superiority in the respective branches:

Pharmacy—John Culley, Utah.

Chemistry—Chas. E. Hamilton, Ohio.

Materia Medica—Chas. C. Manger, Missouri.

General Pharmacy—Charles J. Black, Pennsylvania.

Operative Pharmacy—Lewis Reese, Pennsylvania.

Analytical Chemistry—Edwin Hodgson, Virginia.

Specimens—Frank H. Atkins, Pennsylvania.

A special certificate was given to August G. Wegener, of Germany, for the best collection of botanical specimens.

Mr. Geo. M. Beringer, Instructor of Microscopy, awarded certificates to the following who had passed the examination in that branch:

Charles Kohler, E. V. Howell, Geo. P. Bertsch, Elwyn P. Barr, E. Q. Anewalt, Emma L. Kay, Willis E. Bowen, John Culley, E. H. Lauer, C. C. Manger, H. B. Hunter, E. W. Gebhardt, W. C. Aughinbaugh, G. R. Christ.

FIG. 1.

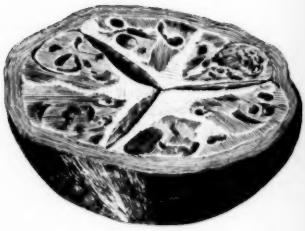

FIG. 2.

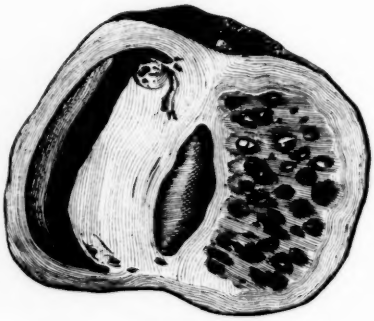

FIG. 3.

FIG. 4.

AMERICAN COLOCYNTH.

Figs. 1 and *2*, Transverse Sections. *Fig. 3*, Longitudinal Section. *Fig. 4*, whole fruit and portion of stem. All reduced.